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AN INTRODUCTION

TO THE STUDY OF

BOTANY;

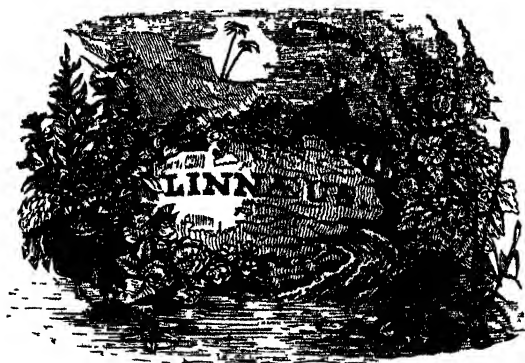
IN WHICH THE SCIENCE IS ILLUSTRATED BY FRAGMENTS OF

NATIVE AND EXOTIC PLANTS,
<sup>as re-
col-
lected by</sup>
AND

EXPLAINED BY MEANS OF NUMEROUS WOOD CUTS

DESIGNED FOR THE USE OF

SCHOOLS AND PRIVATE STUDENTS



BY J. L. COMSTOCK, M. D.

AUTHOR OF A SYSTEM OF NATURAL PHILOSOPHY, ELEMENTS OF CHEMISTRY, &c

THIRD EDITION.

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ADVERTISEMENT.

In the composition of this little book, the Author has had reference to the most recent authorities on Botany, both European and American. The cuts, it is believed, will be found very accurate, and generally highly finished; some of them are from original drawings, and others from the best English Engravings. The work is chiefly designed as a school book for the younger classes, but it is hoped, will also be the means of introducing a taste for the science into families, where there exists a fondness for the cultivation of ornamental exotics. In the apprehension of the Author, the different subjects are made as simple, and at the same time as comprehensive as the circumstances will allow. It is however hoped that he has not sacrificed science to popularity; but that, while the first has been kept constantly in view, as much facility has been afforded the student, both in respect to arrangement, figures, and explanations, as could reasonably be desired.

It has appeared to the Author, that much interest on the subject of Botany might be excited, by connecting with the science, an account of the most essential particulars concerning the culture, and methods of curing the foreign vegetable products in common use, as condiments or articles of luxury, or necessity, together with a short history of the foreign ornamental plants most frequently seen in sitting rooms, including the origin of their names, their native country, and such other notices as might be curious or useful to the cultivators. The classes and orders have therefore been, in the first place, illustrated in this manner, after which the whole are again illustrated in a tabular form, by the most common North American plants.

The very concise epitome of Professor Lindley's Natural System, (which in some parts is founded on that of Jussieu,) is designed more for the purpose of enlarging the student's conceptions of the wonderful regularity and harmony that exists in the works of Creation, than in the expectation of conveying any considerable knowledge of the affinities that have been discovered among the different genera of vegetables. It is hoped, however, that this short illustration will serve to lead some students to the study of Professor Lindley's work, and also that it will in many instances, assist the learner to discover the names of unknown specimens.

The Glossary is supposed to contain all the terms requiring explanation, or which have not been explained in the body of the work.

Hartford, Conn. October 1, 1832.

ADVERTISEMENT

TO THE THIRD EDITION.

THIS edition of the Introduction to Botany, will be found, the Author hopes, to have been much improved.

The chapter on the *Examination of Flowers*, has been placed before the Illustrations of the Classes, and the *Names of the Classes and Orders* illustrated by American plants, have been made to precede the Explanation, or more general account of the Classes. A new chapter is added on the subject of *Buds*, and the explanation of the Greek terms which form the names of the Classes and Orders, have been so changed as to suit the refinement of the present time. Several typographical errors have also been corrected, so that it is believed but very few faults of this kind will be found in this edition.

Hartford, Conn. May, 1835.

RULES FOR PRONOUNCING BOTANICAL NAMES.

VOWELS.

In classical words, there are as many syllables as there are vowels, except when *u*, with any other vowel follows *g*, *q*, or *s*, and when two vowels unite to form a diphthong.

Every accented penultimate vowel is pronounced long, when followed by a vowel or a single consonant, as Achille'a tomento'sa; but it is shortened when followed by two consonants, or a double one, as Sôrbus, Táxus, except when the first consonant is a mute, and the second a liquid, as A'brus.

A, when unaccented, and ending a word, is pronounced like the interjection *ah*, as Dirca, Septaria.

E, final, with or without a preceding consonant, always forms a distinct syllable, as Chelo'nê, Sile'nê, A'loe; also when the vowel is followed by a final consonant, as Tri-chô-man'es, not Tricho-man'es, Vas-cu-la'res, not Vascu-lares, Cel-lu-la-res, not Cel-lu-lares.

I, when ending a syllable, not final, has the sound of *e*, as Mespilus, (*Mes-pe-lus*.) Artimi'sia, (*Ar-ti-me'-sia*.) Epilo'bium, (*Epilo-be'-um*.) In words ending in *ii* the same rule is observed, as Smithii, (*Smithë eye*.)

The diphthongs *æ* and *œ* conform to the rules for *e*, as Spiræ, (*Spi-re-a*.) Diæcia, (*Di-e-cia*.)

CONSONANTS.

The consonants *c* and *g*, are hard before *a*, *o*, and *u*, as Coptis, (*Koptis*;) but they are soft before *e* and *i*, as Geum, (*Jeum*.) Gillenia.

Ch before a vowel sounds like *k*, as Chelidonium, (*Kelidonium*.) Chelo'ne, (*Kelone*.)

Cm, cn, ch, gm, gn, mu, tm, ps, and pt, when they begin a word, are pronounced with the first letter mute, as Pt'eris, (*Teris*.) Cnicus, (*Nikus*.) Gmelina, (*Melina*.) Gnidia, (*Nidea*.) &c.

Sch sounds like *sk*, as Schœnus. (*Skenus*.) Schubertia, (*Skubertia*.)

X at the beginning of a word is pronounced like *z*, as Xanthium, (*Zanthium*.) Xyris, (*Zyris*.)

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INTRODUCTION

B O T A N Y .

THE ROOT. (*Radix.*)

IN our description of the several parts of a plant, we shall follow the order of nature, beginning with the root and ending with the seed.

The root is the foundation, or basis of all perfectly formed plants. It is the part first produced from the seed, and is called the *descending* part of the plant. This part serves the double purpose of fixing the plant to the earth, or in its place, and, generally, of imbibing nourishment for its growth.

In some instances, the inferior plants, or those which are considered, in relation to botany, as imperfectly formed, do not derive their nourishment from their roots.—Such are some of the Flags, or Sea-weeds. There are also many plants, which, though they absorb their nourishment by means of their roots, are not fixed to the ground, but cling to other trees; these are called *parasites*.

Roots, in respect to duration, are either *annual*, *biennial*, or *perennial*.

Annual roots produce their herbage, flowers and seeds, within the compass of a year, or season, after which they decay and return to the dust. Example, Potato, (*Solanum*) Cucumber, (*Cucumis*.)

Biennial roots, are such as produce herbage, but not seeds during the first season. These live through the winter, and produce their flowers and fruit during the second season. Some biennial plants remain green through the winter, as Wheat; while the stalks of others

What part of the plant is the root? What are the uses of the roots? Do all plants derive their nourishment by means of their roots? What are annual roots? What are biennial roots?

decay, like those of annual plants, their roots only living in the ground, and producing stalks, flowers and fruit, the next summer. Examples, Carrot, Parsnip, and Cabbage. These decay the second year.

Perennial roots produce herbage, flowers, and seeds, during many successive years, or for an indefinite period of time. Ex. Oak, Chestnut, Pear, and Orange.

Some trees continue to live, grow, and bear new leaves, flowers, and fruit, for hundreds of years. Such are the Cedar, Oak, and Olive.

Roots are distinguished by botanists into several kinds, depending on their shapes.



Fusiform, or spindle root, Fig. 1, (*Radix fusiformis*,) from *fuscus*, a spindle. This root is thick above, or near the surface of the earth, but gradually diminishes as it shoots into the ground. It is generally simple, or consists of one undivided piece, but is sometimes branched towards the lower extremity.— Ex. Parsnip, Carrot, Beet, and Radish.

Although the bulky part of the Carrot and Beet is commonly termed the root, yet the *true* roots, being the parts which absorb the nourishment of the plant from the earth, consist only of the small fibres which are thrown out from the main body. In perennial roots, or trees, these fibres are renewed, or new ones are produced every year. In our climate these parts are produced early in the spring, beginning to shoot nearly as soon as the frost leaves the ground; hence the best time for transplanting trees is in the autumn, when the old fibres have ceased to absorb nourishment, and may be torn away or left in the ground without injury, while the new ones have not yet begun to spring.

The changes produced by cultivation on many roots, are no less than that of converting an acrid, poisonous substance into wholesome, nutritious food. Thus the wild Parsnip, and Carrot, shoot up large stems, which contain a sharp acrid juice, while their roots are deleterious, and at the same time so hard and dry, as rather to partake of the nature of wood, than of the pulpy, nutritious substance of the cultivated kind.

What are perennial roots? What is the form of a fusiform root? What are examples? What parts constitute the *true* roots of plants? How often are these true roots renewed? When is the best time for transplanting trees? and why?

Fig. 2.



Abrupt, or Premorse root, Fig. 2, (*Radix premorsa.*) This root terminates abruptly, as though it had been bitten off, and hence its name, *premorse*, signifying bitten. Ex. Primrose, (*Primula*,) Devil's bit, (*Scabiosa succisa*,) Violet, (*Viola pedata*.) These roots are not however uniformly, or always premorse, for it is a curious fact that this is only the case after the plant is more than a year old. During the first year, the root is fusiform, after which it becomes woody, the lower part decays and separates, giving the remainder an eroded, or bitten appearance. Afterwards new lateral branches shoot out from the premorse root, to compensate for the decayed part, and by these the plant afterwards receives its nourishment.

Fig. 3.



Branched root, Fig. 3, (*Radix ramosa.*) This is perhaps the most common of all the roots. It is divided into numerous ramifications, or branches, like the limbs of a tree, and trees properly so called, as well as many annual and biennial plants, have this kind of root. The structure of the ramose root differs little from the branches of the tree itself.

For the purpose of illustration, branches may be considered as roots growing in the air, and roots as branches growing in the ground. Indeed, in certain cases, these organs may be mutually converted into each other, for there are many trees, which being pulled up by the roots and inverted, will continue to grow. That is, their tops being buried in the earth, will shoot out fibres and become roots, while their roots, being elevated in the air, will become covered with leaves and produce fruit. A limb of common Willow, and perhaps other species of *Salix*, being inverted, and set into the damp earth, grows perfectly well. If both ends be set in the ground in form of a half circle, each will take root, and the branches will spring from between them. Practical gardeners follow this principle when they bury the limbs of

What is the form of a premorse root? Why is this root called premorse? How are premorse roots formed? What is a branched root? What is said about the mutual conversion of branches into roots, and roots into branches?

shrubs, until they take root, by bending down the body of the tree: after which, each limb being severed from the parent, forms a new tree.

In China, trees are divided and multiplied on the same principle, but in a manner somewhat different. For this purpose, a circle of the bark, an inch or two in length is removed from the limb which it is intended should form the

Fig. 4.



future tree, as at *b*, Fig. 4. This is done in the spring, and the part so left naked is immediately covered with

a ball of moist earth, which is kept in its place by a slip of matting, or other means. Over the ball of earth is suspended a vessel of water, with a small orifice in its bottom, through which the water passes in just sufficient quantity to keep the earth constantly moist. In the autumn, it will be found that many small roots from the limb have shot into the earth. The branch is then sawn off just below this part, and set into the ground; and it is said that if the branch has borne fruit, it will continue to do so the next year, and that in this manner, dwarfs of the smallest sizes may easily be formed.—*Drummond's Bot.*

Fig. 5.



Fibrous Root, Fig. 5, (*Radix fibrosa*.) This root is common to many annual plants, and to most of the grasses. The fibres are commonly thickly branched, and where they grow in a light sandy soil, these are covered with other fibres so small as to resemble down. Dr. Smith suggests that these are provided, not only to fix the plant more strongly in a light soil, but also to present more points of absorption, where the nourishment is small in quantity.

Fig. 6.



Tuberous, or Knotted Root, Fig. 6, (*Radix tuberosa*.) The best examples consist of knobs, connected together by strings or fibres. Some of these are perennial, as the Jerusalem artichoke, (*Helianthus tuberosus*.) Others are annual as the Potato, (*Solanum tuberosum*.)

Necklace, or Moniliform root. This is

How are dwarf trees said to be formed in China? What is a fibrous root? Why are the fibres increased in a light sandy soil? What is the form of a tuberous or knotted root?

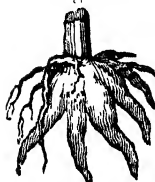
a fibrous root so regularly connected together by its intervening cords as to resemble a necklace. Hence the name moniliform, from *monile*, a necklace.

Fig. 7.



Sometimes many small tubers or knots, grow in clusters, or are scattered on the radical fibres, in a manner resembling grains. These are called granulated roots, Fig. 7, (*Radix granulata*.) Many of the grasses have this kind of root, also Woodsorrel, (*Oxalis acetosella*.)

Fig. 8.



Hand-shaped, or Palmated root, Fig. 8, (*Radix palmata*.) This consists of oblong fleshy tubers, which are connected above but parted below, into divisions resembling the fingers. Ex. Orchis, Dahlia.

Bulbous root, (*Radix bulbosa*.) These are of several kinds, viz.

Fig. 9.



Solid bulb, Fig. 9, consisting of a uniform, fleshy substance. Ex. Crocus, Erythronium, Turnip. These differ from tuberous roots in there being only one tuber attached to a plant, and in other respects, as will be seen directly.

Fig. 10.



Tunicated root, Fig. 10. This consists of many concentric layers placed one over, or without the other. Ex. Onion, (*Allium cepa*.)

Many plants with solid bulbs inhabit sandy barren places; and over the face of which, they are disseminated by the winds, after their flowering season. This is the case with the grass called *Poa bulbosa*.

What is a moniliform root? What is the form of a granulated root? What is the form of a palmated root? What is the difference between the scaly bulb and solid bulb? What kind of root is the onion?

Fig. 11.



Scaly bulb, Fig. 11, (*Bulbous squamosus*.) Consisting of scales connected only at the base, and which overlay each other. Ex. White Lily, (*Lilium candidum*.)

Sometimes many small bulbs are enclosed in the same coating, as in the common Garlic, (*Alium sativum*.)

Bulbs are considered in their nature, analogous to buds. They are the reservoirs which keep the germs of the future plants during the winter. In a few instances bulbs grow on the stalks of the plant, and falling on the ground take root, and produce perfect plants. This is the case with the Orange Lily, (*Lilium bulbiferum*.) which contains small bulbs in the axilla of each leaf. In general the bulb dies on the approach of winter, the species being continued by the production of new ones, which are nourished by the remains of the old.

Many bulbous roots form important articles of food. In Africa, several roots of this kind are in common use, and in some parts of Italy, it is said that tulip roots are employed for the same purpose among the poor. Among the inhabitants of Kamschatka, the bulb of a certain kind of lily is of the highest consequence as an article of food. At the time of its flowering, the ground in some places is entirely covered by its blossoms. At the proper season, the bulbs are gathered, dried in the sun, and thus prepared for use.—They are afterwards baked or dried still more by artificial heat, and then reduced to powder, and of this the best bread of these poor people is made. These bulbs are also eaten both boiled and roasted.—*Pennant*.

Almost all nations are acquainted with the bulbs of the Onion, Leek, and Garlic. It is most probable that Egypt is the native country of the Onion, and perhaps of the others also. In the most ancient of historical records, these roots are spoken of as articles of food, and are mentioned among the luxuries, the want of which the children of Israel so bitterly deplored after their departure from the land of Egypt. "And the children of Israel also wept again, and said, who shall give us flesh to eat? we remember the fish

What is the form of a scaly bulb? In what respect are bulbs analogous to buds? In what instance does the bulb grow on the stalk of the plant? What is said of the bulbous roots as articles of food? What bulbous roots are mentioned in the most ancient historical records?

which we did eat in Egypt freely; the cucumbers and the melons, and the *leeks*, and the *onions*, and the *garlic*."—Numbers, chap. xi.

The onions of Egypt are said by travellers to be highly delicious and savory, and almost entirely without that strong nauseous flavor, which renders them so disagreeable to many persons in other countries. It is also stated that the onions of that country are of a very pure white—that they are constantly exposed for sale in the streets, dressed or cooked in various ways, and that they form the chief sustenance of the poor. The leek is also in high estimation among the people of Egypt at the present day; a few bulbs of this root and a little bread forming the favorite dinner of the lower classes.

Fig. 12



Repent, or Creeping root, fig. 12, (*Radix repens*.) This root creeps along on the surface of the ground, or just under it, and throws out fibres at various intervals. Ex. Mint, (*Mentha*,) Strawberry, (*Fragaria*.)

This kind of root is exceedingly tenacious of life, so much so, that if any portion be thrown upon the ground, in a moist place, it will shoot out new fibres, and finally become a perfect plant of its species. The well known Couch or Squitch grass, (*Triticum repens*,) is to gardeners a most troublesome example of this kind of root. It is found in nearly every country, always preferring the best soil, and creeping into places where it is least wanted. Its root has a sweetish taste, and though generally so mischievous, has occasionally been used for food in times of scarcity. In Italy, and in some parts of France, this root is collected by the poor, and sold as food for horses.

The Repent root, though often so vexatious to gardeners, is highly useful to others. The very existence of Holland is said to depend on the growth of this kind of root. That country, it is well known, is surrounded by dikes, or dams, which prevent the inundation of the sea. The earth of which these dikes are composed, is bound together by various creeping roots, so firmly as to enable them to resist the action of the water, and prevent them from being washed

What is said of the delicious taste of the onions of Egypt? What are examples of the repent root?

away, and the whole country overflown,—a striking proof that these humble, and sometimes vexatious plants, were, on the whole, created with a beneficent intention to man.

Many other plants, which, in some situations, appear not only useless, but pernicious, as occupying the soil, and thus preventing the growth of useful plants, are, still, under other circumstances, of great importance to man. Thus the traveller Hasselquist, in his voyage to Egypt, mentions a small reed, which, though of no apparent use in ordinary situations, is of the highest consequence on the banks of the Nile. The very soil of Egypt, says this traveller, is owing to the presence of this plant, for its matted roots have stoped the earth which floated in the water of that river, and thus has been formed large portions of a habitable country.

The roots we have heretofore described, are attached to the earth, from which they draw nourishment for the growth of the plants. In all plants of any considerable size, it is obvious that this must be universally the case. There are, however, some plants whose roots are not fixed to any solid substance, but float in the water, from which, therefore, they must receive their nourishment. The plant called

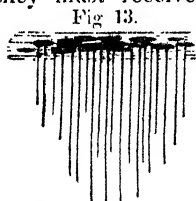


Fig 13.

Duck-Meat, (*Lemna minor*,) Fig. 13, is of this kind. This minute plant is found in ditches, with its green leaves swimming on the surface of the water, which it often covers in patches. Its thread-like roots hang suspended from the under surfaces of the leaves, and this constitutes the whole plant.

There is another small plant which grows with the Duck-Meat, and which, while young, has floating roots. This is the Water Star grass, (*Callitriche aquatica*.) Before this little plant flowers, its roots are suspended in the water, and from which, therefore, it must draw its entire nourishment. But it is a fact well known to botanists, that few plants of any kind will produce perfect seeds, when nourished by water alone; and nature has made a singular and curious provision, with respect to this plant, on this account. After the flower begins to decay, the roots instead of remaining suspended as before, strike down into the mud, and finally

In what situations are repent roots particularly useful to mankind? What is said of the use of a small reed on the banks of the Nile? What is said of floating roots?

the whole plant is drawn to the bottom, where its seeds ripen. These seeds rising to the surface, germinate, and in their turn, produce a new progeny, which float there until having perfected their flowers, they sink to the bottom, where, like their ancestors, they ripen their seeds. The Floating Liverwort, (*Riccia natans*,) is another floating plant. Its frond or leaf is nearly an inch in diameter, and divided into channels. Some plants even swim about at random in the water where they were produced, and continue to grow on their journeys. This is the case with that sea plant called Gulph-weed, by sailors, and *Fucus natans* by botanists. It is found in the Gulf of Florida, and in the Gulf stream, and other parts of the ocean, floating in masses or fields many miles in extent.

Other plants which were originally attached to the soil, are occasionally loosed from their situations and float to great distances, being driven by winds or currents. The Water house-leek, (*Pistia stratiotes*,) is of this kind. It is common in Georgia and Florida, in the U. States, and in the East and West Indies. This plant has some resemblance to garden lettuce, but has very different habits. It grows near the shores of lakes and rivers, covering their surfaces for miles in extent. Its roots are long and generally strike into the mud, or reach the half decayed logs at the bottom. Sometimes large fields of this plant are detached, either by the sudden rising of the rivers, or by a strong wind on the lakes, and are thus transported from one place to another, often to great distances. Bartram, in the account of his travels in Florida, gives a very picturesque description of these floating meadows which he saw.

Some plants live and thrive almost entirely without roots, and consequently absorb their nourishment from the air by means of their leaves. As every plant is fitted for its situation by peculiar organs or adaptations, so in these cases, the leaves of such plants are formed for the absorption rather than the exhalation of fluids. The House-leek, (*Sempervivum*,) which name signifies "to live forever," though a common plant, is a very curious one on this account. It will grow for weeks, or months, without the least root, and without either earth or water, and still preserve its succulent,

What curious provision is exhibited in the ripening of seeds of the water starwort? Under what circumstances does the gulf weed grow? What account is given of the floating plant, water house-leek?

pulpy appearance. Other plants, under the same circumstances, become perfectly dry in a few days. This difference undoubtedly depends on the difference of structure, by which plants as well as animals are adapted to their several situations.

The roots we have described are as follow.

1. Fusiform, or Spindle shaped. Ex. Dock.
2. Premorse, or Bitten off. Ex. Pedate Violet.
3. Branched, or Ramose. Ex. Most Trees.
4. Fibrous. Ex. The Grasses.
5. Tuberosc, or Knotted. Ex. Potato, Artichoke.
6. Palmated, or Hand Shaped. Ex. Orchis.
7. Solid Bulb. Ex. Crocus, Turnip.
8. Tunicated Bulb. Ex. Onion.
9. Scaly Bulb. Ex. White Lily.
10. Repent, or Creeping. Ex. Strawberry.
11. Floating Root. Ex. Lemna.

THE STEM. (*Caulis*.)

The Stem, or Stalk, is that part of the plant which rises above the surface of the ground. It is sometimes called the *ascending*, as the root is the descending part of the vegetable.

In relation to botany, the use of the stem is to elevate the leaves, flowers and fruit above the earth, for the benefit of air and light. It is not an essential part of vegetables, since many of the inferior orders, as the Ferns, and Mosses, are without stems.

The words, Stem, Stalk, and Trunk, are all employed to signify the same part. This part is so various in different species of plants, as to require several divisions, and even subdivisions, in order to be distinguished.

1. **TRUNK.** The Trunk, or Stem, properly so called, is the ascending part of all trees and shrubs, and of many herbaceous, or annual plants. It may be *woody*, *succulent*, or *fleshy*; also *medullary*, that is, containing a pith, or it may be empty, hollow, simple, branched, &c.

Woody Stem, (*Caulis ligneus*.) Trees and shrubs gene-

How is the fact accounted for that some plants will live and thrive without roots? What are the several species of roots described? What part of the plant is the stem? What is the use of the stem? What other words are used to signify the same part?

rally have solid, or woody stems. This kind of stem, which is usually called the Trunk, furnishes the wood which is employed for fuel, and in the arts. In respect to size, texture, hardness, durability, color, and specific gravity, there are wide differences in the wood of different species of trees. Some trees stand and grow during the lapse of ages. Others are comparatively short lived, and begin to decay soon after they arrive at maturity. Some attain, both in height and bulk, to an enormous magnitude, while others never grow higher than a few feet, or even inches, having trunks no larger than straws. It is said that certain species of the Fig-tree, growing in South America, attain the size of twenty-five feet in diameter, and that the African Calabash, or Monkey-bread, (*Adansonia digitata*), is sometimes thirty feet in diameter. But these are but shrubs when compared with the celebrated Chestnut of Mount Etna, so often described by travellers. According to Mr. Swinburne, this tree measures at the ground, 196 feet in circumference, which is nearly sixty-five feet in diameter. The height to which some trees attain, without reference to their diameter, is also truly astonishing. Some of the North American Pines are two hundred feet in height, and as straight as though their growth had been directed by the plumb-line of a master-builder.

Fig. 14.



From these gigantic trunks, nature furnishes every intermediate size of the woody stem, down to that of the Arctic Bramble, (*Rubus arcticus*), an entire shrub of which may be placed in a six ounce vial. Still more diminutive is a kind of Willow, (*Salix herbacea*), which Dr. Clarke says is the only tree growing in Spitzbergen.

Fig. 14, represents this shrub of the usual size, with its roots, branches and leaves entire.

In respect to the longevity of trees, it is known that some species live from one generation of man to another. Oaks are now growing in

What plants have woody stems? In what respects do woody stems differ? What is said to be the circumference of the great Chestnut of Mount Etna? How tall are some of the North American Pines said to be?—What is said of the size of the *salix herbacea*?

this country, which were large trees long before the time of Columbus. Indeed it is probable that many trees live at least a thousand years, and it is by no means certain that there are not trees now living which were planted before the Christian era. On the contrary, some trees which attain to a considerable size live only for a short period. In this country the Lombardy Poplar, an exotic, begins to decay soon after it arrives at maturity, and sometimes perhaps even sooner. In general the longevity of a tree, like that of an animal, is in proportion to the time required for it to come to maturity, or attain its full growth. Thus the Oak grows for a century, while the Lombardy Poplar attains its full size in twelve or fifteen years.

Medullary or Pithy Stem, (*Caulis medulosus*.) The medulla, or pith, is the well known soft, compressible, light substance contained in the centre of many ligneous plants, as the Elder, (*Sambucus*.) Many plants when young contain pith, which is replaced by wood as they grow old. The young shoots of common Elder always contain the largest pith, though their stems may be only half the size of those of the parent. Hence in this plant, it must be inferred, either that the pith is converted into wood, or that the woody fibres increase around it.

It seems to be a provision of nature, that where the stem is medullary, the wood surrounding it should be peculiarly strong and compact. A species of Palm, which attains to a considerable height, is only three inches in diameter, and nearly two and a half inches of this is composed entirely of pith. But to compensate for this want of strength in the interior, the ligneous, or external part, is so hard and elastic, as rather to resemble whale-bone than the wood of other trees.

The pith of some trees is of considerable consequence as an article of food. The Sago of commerce is made of the pith of a species of Palm, (*Sagus rumphii*.) single trees of which are said sometimes to yield six hundred pounds of this nutritious substance.

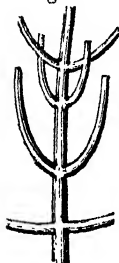
Hollow, or Tubular Stem, (*Caulis tubulosus*.) Hollow stems are not uncommon in garden plants. Fennel, Dill,

What is said of the longevity of trees? Is there any proportion between the longevity of trees, and the time of their full growth? What is meant by a medullary stem? In common elder do the young or old shoots contain the largest pith? What is said of the strength of medullary stems? Is any use made of the pith of trees?

Parsley, and many others of this tribe, present examples.—The Trumpet tree of the West Indies, (*Cecropia peltata*), has not only a hollow stem, but all its branches are tubes.—This tree grows to the height of thirty, or forty feet, and is of a proportionate diameter. The interior is divided into compartments by transverse membranous partitions. The branches being cleared of these partitions, are employed for wind instruments, and hence its name, Trumpet tree.

• Simple Stem, (*Caulis simplex*.) This merely signifies that the stem is not branched, as in the Lily and Bamboo.

Fig. 15.



Branched Stem, (*Caulis ramosus*.) Of this there are several kinds, as *Brachiate*, having arms, which alternately cross each other, Fig. 15. *Dichotomous*, forked, when the divisions are only in two parts. Much branched, as in the Apple, and Pear-tree.

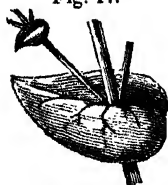
Fig. 16.



Naked Stem, (*Caulis nudus*.) This is a stem without leaves or thorns. Ex. Jointed Saltwort, (*Salicornia herbacea*.) Fig. 16. This plant grows on the sea shore, and is common in this country. Stem about a foot high, fleshy, green, and jointed. Branches opposite, and also jointed. There are several species of this plant, all of which are burned for the purpose of obtaining the soda of commerce. For this purpose the plants are collected, dried, and reduced to ashes. The ashes being lixiviated, the water contains the soda in solution, which is obtained by subsequent evaporation. This plant is also pickled in salt and vinegar, like samphire, for culinary purposes.

What is a simple stem? What is a branched, and what a naked stem? What is an example of a naked stem?

Fig. 17.



Perfoliate Stem, (*Caulis perfoliatus*).—
Fig. 17. The stem passes through the leaf,
or the leaf surrounds the stem. Ex. Perfo-
liate Bellwort, (*Uvularia perfoliata*.)

Some trees are provided with several stems or props, by which their branches are supported, and kept in a horizontal position. The Black Mangrove, (*Rhizophora mangle*), which grows in the West Indies, is an example. The limbs spread to such a distance from the trunk as to require support, otherwise they would bend to the ground, or be broken by their own weight, both of which, nature has contrived the means of preventing. When the branches are no longer capable of supporting themselves, they send forth soft, lax strings in many places, which grow rapidly downwards, and soon reach the earth, where they take root. In a few months they begin to give support to the branches above, and finally become capable of sustaining all the weight required.

There is also another tree, which grows in the East Indies, whose branches are propped in the same manner.— This is the celebrated Banyan tree, (*Ficus Indica*), and on account of its great size affords the most remarkable instance of this kind of support. Its mode of increase is precisely like that of the Mangrove, above described. The eastern traveller, Forbes, describes one of these trees which he visited on the bank of a river in India. A part of it had been swept away by an inundation of the river, but the principal stems still remained, and occupied a space which measured about two thousand feet in circumference, though many of the branches which had not yet sent down stems extended much farther. The large trunks of this tree amounted to three thousand and fifty in number, besides which there were as many more of a smaller size. On one occasion this huge Banyan had given shelter to an army of seven thousand men.

What is meant by a perfoliate stem? In what manner are the limbs of the black mangrove said to support themselves? What is said of the size and shape of the Banyan tree?

Fig. 18.



Fig. 18, represents this tree, though comparatively few of its stems are shown. We take the figure from Drummond's Botany.

Fig. 19.



Spiral, or Twining Stem, (*Caulis volubilis*.)

Fig. 19. The Bean, Hop, and Grape are familiar examples of this kind of stem. Some plants turn to the right, and others to the left, but in this respect they are governed by invariable laws, that is, one plant of the same species never twines to the right and another to the left. The Hop, for example, turns round its pole, from the left to the right, and if every plant of this species in a field be examined, they will all be found to turn in the same direction. To ascertain this, let the face be turned towards the south, the east being on the left and the west on the right. Then it will be found that the hop vine makes all its volutions from the left hand towards the right, that is, from the east towards the west, or *with* the apparent motion of the sun. On the contrary, the Bindweed, (*Convolvulus*), the Kidney Bean, (*Phaseolus*), and many other vines, turn from the right to the left, or *against* the motion of the sun. It is said that if these plants are forced to grow in a contrary direction, that it injures, and sometimes even kills them!

In hot climates, where vegetation attains its largest size, there are some twining plants that strike the foreign traveller

- What are common examples of the spiral stem? What invariable law do twining stems observe with respect to turning to the right, or left?

with perfect astonishment. Mr. Bartram states, that in Georgia and Carolina, the Grape vines are a foot in diameter, and that they climb to the very tops of the tallest trees, and then running from one tree to another, as it were, bind the whole forest together.

In the forests of Surinam, according to the traveller, Steadman, there is a singular climbing plant called the *nebee*, or ligneous rope. The stems of this plant not only twine around the trees to their tops, but when arrived there, they often run down again until they reach the earth, where throwing out several roots, they run up the next, and so spread from one tree to another, to a great extent. Sometimes these stems twine around each other, and as they are often to a considerable distance barren of leaves, they form ropes of the thickness of a ship's cable, which they very nearly resemble. These ropes are said to be exceedingly strong, so that they are employed for mooring ships to the shore, instead of hemp cables.

CULM, or STRAW, (*Culmus*.) The Culm is the stem of the grasses, rushes, and other plants which most resemble them, as the *Cat's-tail*, and Bamboo. It bears both leaves and flowers, and is often hollow, and seldom branched.

The Culm is distinguished into several kinds, which are thus described.

Fig. 20.



Jointed, or articulated Culm, Fig. 20. It is divided from space to space, by knots, or joints, as in the straw of the Oat, Wheat, and Bamboo. Among the jointed stems, perhaps that of the Bamboo is the most interesting and beautiful, and so far as the Culm itself is concerned, certainly the most useful. This plant, which is a native of warm climates, grows to the height of forty feet, or more, though scarcely more than three inches in diameter at the base. The graceful waving of a forest of such elastic rods, during a breeze, is said to present to the eye of the foreign traveller a spectacle of great novelty and interest. The Culm is straight, round, tough, simple, and highly polished by nature. There are, perhaps, few plants which serve for such variety of purposes as this. In the East

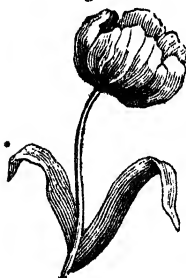
What is a culm? What are familiar examples of the jointed culm?—What is said to be the most interesting and useful among the jointed culms?

Indes, great use is made of it in building, the houses of the poor being almost entirely composed of it, with the crevices stopped with mud, or clay. Bridges are also constructed of it, as well as cups for drinking,—mats to lie on,—pipes for conveying water,—boxes for various purposes, and fences for fields and gardens. Of its fibres, sacking is made to hold grain, and of the same, cordage, and cables for ships are formed. In China, Bamboo serves to make, not only chairs, tables, and bedsteads, but bedding also, and paper is said to be made of it. In the West Indies it serves for a great variety of mechanical purposes, besides which its tender shoots are pickled for the table.

Geniculated Culm, (*Culmus geniculatus*.) Geniculated means bent like the knee. This Culm is peculiar to a few species of Grass, among which are the Floating Fox-tail, (*Alopecurus geniculatus*.)

Simple Culm, (*Culmus enodis*.) This is a Culm without joints, or knots, and is generally straight and smooth, as in the common Rush, (*Juncus*), and the Cat's-tail, (*Typha*.)

Fig. 21.



SCAPE, (*Scapus*.) Fig. 21. This is the Flower Stem. It springs from the root, and elevates the flower, and bears the fruit, but not the leaves. The Side-saddle flower, (*Sarracenia*), Daffodil, Primrose, (*Primula*), and the Colt's-foot, (*Tussilago*), are examples. These are called *acaules*, or *stemless* plants. Several of the Violets are stemless, and are thus distinguished from those whose stems bear leaves as well as flowers.

PEDUNCLE, (*Pedunculus*), the Flower stalk which springs from the stem, or branch, and bears the flower and fruit, but no leaves. The *pedicel*, or partial flower stalk, is the ultimate subdivision of the peduncle. The Common Elder, (*Sambucus canadensis*), is an example. The *peduncle* is the

How is the simple, distinguished from the jointed culm? What is a scape? What are familiar examples of the scape? What is the peduncle?

stalk which bears the cluster, or cyme of berries, while each berry has its own *pedicel*.

The Flower stalk is said to be

Cauline, (*Caulinus*), when it grows immediately out of the main stem. Ex. Indian Shot, (*Canna Indica*.)

Radical, (*Radicalis*), when it proceeds immediately from the root. Ex. Primrose, (*Primula*.) This is called a scape.

Ramose, (*Rameus*), when it proceeds from a branch. Ex. Poplar, (*Populus*), Cherry.

Axillary, (*Axillaris*), when it proceeds from between the leaf and stem. Ex. Passion Flower, (*Passiflora*.)

Terminal, (*Terminalis*), when it terminates a stem, or branch, or proceeds from its extreme end. Ex. Crown Imperial, Tulip.

PETIOLE, (*Petiolus*), the Foot Stalk of the leaf. This is the part usually small, which connects the leaf with the tree, or when the leaves are radical, with the root. It is commonly channelled on the upper side.

Fig. 22. The Petiole is *simple* when it bears only a single leaf, Fig. 22, as in the sweet scented Geranium, Apple, Plum, and Rhubarb; or *compound* when it bears several leaves, as in the Coriander, (*Coriandrum sativum*), and Rose.



There are also several other kinds of leaf stalks, as,

Fig. 23. **Winged Petiole**, (*Petiolus alatus*), when the petiole is expanded into a leafy border on each side, in the form of wings. Ex. Orange tree.



Sheathing, (*Petiolus vaginans*), when the leaf stalk embraces the stem. Ex. Wheat, Indian Corn.

Compressed Petiole, (*Petiolus compressus*), when the leaf stalk is compressed, or flattened. Ex. Aspen, (*Populus tremula*.) To this form of the petiole, the constant tremulous motion of the leaves of this tree is attributed.

What is the pedicel? When is the flower stalk said to be cauline? When radical? When is it ramose? When is it said to be terminal? What is the petiole? When is the petiole simple? When is it compound? When winged? When sheathing? When compressed?

Fig. 24.



FRONS, or FROND, Fig. 24. This is the stem and leaf in one, or in other words, the flowers and fruit are produced on the leaves themselves. This stem is peculiar to flowerless plants. **Ex.** Common Polypody, (*Polypodium vulgare.*) The figure represents a Frond, with the fruit on its back.

Fig. 25.



STIPE, (Stipes,) Fig. 25. The stipe is the part which elevates the cap in the Fungus tribe. It is the stem of the Mushroom or Toad-stool. This term is also applied to the little pillar which supports the down in the compound flowers, or connects the wings with the seeds as in the Dandelion and Salsify.

THE LEAF. (*Folium.*)

The leaf is so general an organ of plants, that its absence, especially in warm climates, would deprive the face of the earth of her greatest beauty; and yet this is not an universal or essential organ. In some plants, as in the Saltwort, (*Salicornia,*) and in most of the cryptogamous class, it is entirely wanting. Leaves are generally oblong and expanded in their forms, and for the most part thin and delicate in their texture. Some are however, fleshy and succulent, as in the House-leek tribe. In almost all leaves the upper and under surfaces differ from each other in color, or in texture, the upper surface being more commonly smooth and polished, while the under one is rough, or covered with hoary down.

Leaves are furnished with minute vessels, through which the sap circulates, and in the upper surface is exposed to

What is a frond? What is the difference between a stipe and a scape? Is the leaf an essential organ of plants? In what tribe are the leaves chiefly wanting? What difference commonly exists between the upper and under surfaces of the leaves?

the influence of heat and light. In consequence of this exposure, and the action of certain organs with which this part is furnished, the qualities of the sap are changed, and it assumes the odor or fragrance peculiar to the leaves of some plants. After the sap has undergone this change, it is sent back to the bark of the tree, where it suffers another change, and is converted into wood. Mean time the watery and superfluous parts of the sap are thrown off, from the under surface of the leaf.

FORMS OF THE LEAVES.

With respect to *form*, leaves are divided into *simple* and *compound*.

Simple Leaves. Leaves are *simple* when only one grows on the same petiole, as the Oak, Chestnut, Rhubarb.

Compound Leaves. Leaves are said to be compound, when several leaves or *leaflets* grow on the same petiole, as in the Rose, Elder, and Senna.

The outlines, or *forms*, most common to the simple leaves, are the following.



Round, Fig. 26, (*orbiculata*), having the longitudinal and transverse diameters equal. Ex. Pimpernel, (*Anagallis tenella*.) It is very rare that precise examples of this leaf occur in nature. The specific name, round-leaved, (*rotundifolia*), though often applied, is therefore very seldom strictly applicable.

Fig. 27.



Ovate, Fig. 27, (*ovata*), egg-shaped, having the form of an egg divided lengthwise into two halves. The length is greater than the breadth, and the base broader than the apex. Ex. Chequer berry, (*Michella repens*.) Pear. *Obovate* is this form reversed.

Fig. 28.



Roundish, Fig. 28, (*subrotund*.) Nearly round, having little difference between the longitudinal and transverse diameters. Ex. Round-leaved Wintergreen, (*Pyrola rotundifolia*.) Green brier, (*Smilax*.)

What effect do the leaves produce on the sap? How are leaves divided with respect to form? When are leaves said to be simple? When are leaves compound? Give an example of a round leaf. Of an ovate leaf. Of a roundish leaf.

Fig. 29.



Oval, Fig. 29, (*elliptical*), having the length greater than the width, with the curvatures at both ends alike. Ex. (*Lespedeza prostrata*.)

Fig. 30.



Oblong, Fig. 30, (*Oblonga*), having the longitudinal diameter several times greater than the transverse one. Ex. Umbelled Wintergreen, (*Pyrola umbellata*), Solomon's seal.

Fig. 31.



Lanceolate, Fig. 31, (*Lanceolata*), spear-shaped. It is several times longer than wide, gradually tapering towards the two extremities, and ending in a sharp point. Ex. Narrow Plantain, (*Plantago lanceolata*), Sweet William, (*Dianthus*.)

Fig. 32.



Linear, Fig. 32, narrow, with the edges parallel, except at the two extremities. Ex. Club Spurge, (*Euphorbia clava*.) Most of the Grains and Grasses have linear leaves.

Fig. 33.



Subulate, Fig. 33. Awl-shaped. Gradually tapering from the base, or insertion of the petiole, and ending in a point. Ex. Common Sandwort, (*Arenaria rubra*.)

Fig. 34.



Reniform, Fig. 34, kidney-shaped, a short, broad, round leaf, with a sinus, or hollow at the base. Ex. Common Asarum, (*Asarum Canadense*.) Colts-foot, Gill-blechoma.

Give an example of an oval leaf. Of an oblong leaf. Of a lanceolate leaf. Of a linear leaf. Of a subulate leaf. Of a reniform leaf.

Fig. 35.



Heart-shaped, Fig. 35, (*Cordiform*.) having the length greater than the breadth, with an ovate form, hollowed out at the base. Ex. Two-leaved Solomon seal, (*Convallaria bifolia*.)

Fig. 36.



Lunate, Fig. 36, crescent shaped, or like a half moon. It approaches the reniform but the two lobes at the base are more or less pointed. Ex. Two leaved Birthwort, (*Aristolochia bilobata*.)

Fig. 37.



Arrow-shaped, Fig. 37, (*Sagittate*.) triangular, with the base divided, and ending in points, the other angle extended and acute. Ex. Arrow-head, (*Sagittaria sagittifolia*.)

Fig. 38.



Lyrate, Fig. 38, (*Lyratum*.) lyre-shaped, cut laterally into several transverse segments or lobes, of which those nearest the stem are the smallest. Ex. Lyre leaved Sage, (*Salvia lyrata*.)

Fig. 39.



Panduriform, Fig. 39, fiddle-shaped. It is oblong, broad at the two extremities, and contracted in the middle. Ex. Virginian Bindweed, (*Convolvulus panduratus*.)

Fig. 40.



Runcinate, Fig. 40, (*Lion toothed*.) cut into several transverse acute segments, pointing backwards. Ex. Dandelion, (*Leontodon taraxacum*.)

Give an example of a heart-shaped leaf. Of a lunate leaf. Of an arrow-shaped leaf. What is the form of a lyrate leaf? Of a panduriform leaf? Of a runcinate leaf?

Fig. 41.



Hastate, Fig. 41, (*Halbert shaped*,) triangular, the base spreading and ending in two opposite angles; the form oblong, ending in a point, with the sides somewhat hollowed. Ex. Bittersweet, (*Solanum dulcamara*.) Canary Sage, (*Salvia Canariensis*.)

Fig. 42.



Sinuate, Fig. 42, cut into rounded lobes, or wide openings, the margins bending in and out. Ex. Water Horehound, (*Lycopus Europæus*.) Red Oak, (*Quercus rubra*.)

Fig. 43.



Pinnatifid, Fig. 43, (*wing cleft*.) The leaf is transversely divided into small lobes or oblong segments; but not reaching to the midrib. Ex. Wild Peppergrass, (*Lepidium virginicum*.)

Crenate, notched, with the teeth rounded and not directed to either end of the leaf. Ex. Ground Ivy, (*Glechoma hederacea*.)

B



Laciniated, B, cut into numerous irregular portions, or deep notches. Ex. Crow-foot, (*Ranunculus*.) Crane's bill, (*Geranium*.)

Fig. 44.



Palmate, Fig. 44, (*palmated*,) hand-shaped, divided nearly to the insertion of the petiole into oblong lobes of similar sizes, but leaving a space entire, like the palm of the hand. Ex. Passion flower, (*Passiflora carula*.) Castor Oil plant, (*Ricinis communis*.)

What is the form of a hastate leaf? Of a sinuate leaf? Of a pinnatifid leaf? Of a crenate leaf? Of a laciniated leaf? Of a palmate leaf?

Fig. 45.



Lobed, Fig. 45, (*lobatum*,) divided into segments, the margins of which are rounded. Ex. Liver leaf, (*Hepatica triloba*,) Sassafras, (*Laurus sassafras*.)

Fig. 46.



Dentate, Fig. 46, toothed, beset with projecting, horizontal, distant teeth, of the same substance as the leaf. Ex. Blue Bottle, (*Centaurea cyanus*,) (*Atriplex lacinata*.)

Fig. 47.



Serrate, Fig. 47, (saw-like,) the border being cut into notches ending in sharp points, which incline towards the apex of the leaf. Examples of this are very abundant, as Nettle, (*Urtica*,) Rose, (*Rosa*,) Peach, (*Amygdalus*.)

Fig. 48.



Erose, Fig. 48, (jagged,) having an appearance as though it had been gnawed, or bitten, by insects. Ex. Fire weed, (*Senecio hieracifolius*.)

With respect to their *summits*, the following distinctions are the most common.

Fig. 49.



Acuminate, Fig. 49, (pointed,) with an extended termination, and in this respect, differing from the lanceolate leaf. Ex. several species of the grass Panicum, and of the Reed, (*Arundo*.)

What is the form of a lobed leaf? Of a dentate leaf? Of a serrate leaf? Of an erose leaf? Of an acuminate leaf?

Fig. 50.



Cuspidate, Fig. 50, terminated suddenly by a bristly point. Ex. Rosy tritonia, (*Tritonia rosea*.) *Mucronate* is nearly a synonymous term, and applicable to the spiny terminations of the leaves of the Thistles, and some species of the Aloe.

Fig. 51.



Emarginate, Fig. 51, nicked, having a small notch at the end. Ex. Bladder senna, (*Colutea arborescens*.)

Fig. 52.



Obtuse, Fig. 52, blunt-pointed, the termination being in form of the segment of a circle. Ex. Primrose, (*Primula*.) Examples of this are not common.

Fig. 53.



Cirrhmose, Fig. 53, tendrilled, the leaf ending in a tendril or clasper, by which the plant clings for its support. Ex. Superb Gloriosa, (*Gloriosa superba*.)

With respect to the *surfaces* of leaves the following distinctions are made.

Fig. 54.



Smooth, Fig. 54. A leaf is said to be smooth, when it is without hairs, wrinkles, or ribs. Ex. Indian cucumber, Water plantain.

Velvety, villose, covered with soft hairs or down. Ex. Velvet leaved Primrose, (*Primula villosa*.)

What is the form of a cuspidate leaf? Of an emarginate leaf? Of an obtuse leaf? Of a cirrhmose leaf? Give an example of a smooth leaf. Of a velvety leaf.

Fig. 55.



Nerved, or ribbed, Fig. 55, having small longitudinal elevations, running from one extremity to the other, without ramifications. Ex. Narrow plantain, (*Plantago lanceolata*.)

Fig. 56.



Veined, Fig. 56, (venosum,) having prominent divisions near the base, which as they extend grow smaller, and finally spread over the leaf, ramifying with each other. Ex. Pear, (*Pyrus*.) Mullein, (*Verbascum lychnitis*.)

Fig. 57.



Wrinkled, Fig. 57, (*rugose*) rough, or corrugated; as though the veins had contracted, causing the membrane to swell and sink into little inequalities. Ex. Sage, (*Salvia*.)

Fig. 58.



Plicate, Fig. 58, (plaited,) the nerves alternately rising and sinking, forming the surface into ridges and channels, as though the leaf had been plaited, or laid in folds. Ex. White Hellebore, (*Veratrum viride*.) Ladies' mantle, (*Alchemilla vulgaris*.)

COMPOUND LEAVES.

When several leaves or leaflets grow on a common foot stalk, they are called *compound*. Such leaves do not fall singly from the tree, but as the fall is occasioned by the separation of the common foot-stalk, all the leaflets forming a compound leaf descend at the same time. Ex. Butternut, (*Juglans cinerea*.)

Give an example of a nerved leaf. Of a veined leaf. Of a wrinkled leaf. Of a plicate leaf. When are leaves said to be compound?



Fig. 60.

Binate, Fig. 60, (*binatum*), two leaved, when the common petiole bears two leaves on its summit. Ex. Dwarf dogwood, (*Cornus suecica*.)



Fig. 61.

Ternate, Fig. 61, three leaved, when the petiole bears three leaves. Ex. Clover, (*Trefoil*.)



Fig. 62.

Biternate, Fig. 62, twice three leaved; when the common petiole divides into three parts, each of which bears three leaflets. Ex. Fumitory, (*Fumaria lutea*.)



Fig. 63.

Triternate, Fig. 63, three times three leaved, when the foot-stalk divides into three parts, and each of these three parts are again subdivided into other three parts, each of which bears three leaflets. Ex. Low Anemone, (*Anemone nemorosa*), Wind flower, (*Anemone virginiana*.)



Fig. 64.

Pedate, Fig. 64, foot shaped, that is, like a bird's foot; when the leaf is ternate, with the lateral leaflets divided again. Ex. Passion flower, (*Passiflora pedata*.) It is similar in form to the palmate leaf, but is more deeply divided.

When a petiole has a number of leaflets on its sides, standing opposite, or alternate, it is called winged, or pinnate, from the Latin *pinna*, a pinion, or wing. Ex. Rose, Ash.

- What is the form of a binate leaf? Of a ternate leaf? Of a biternate leaf? Of a triternate leaf? Of a pedate leaf?

Fig. 65.



Unequally pinnate, Fig. 65, when a pinnate leaf is terminated at the end by an odd leaflet. Ex. Rose.

Fig. 66.



Abruptly pinnate, Fig. 66, when the petiole of a winged leaf ends abruptly, that is, without a leaflet, or tendril. Ex. Senna, (*Cassia marylandica*.)

Fig. 67.



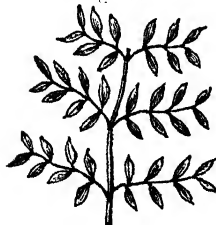
Alternately pinnate, Fig. 67, when the leaves alternate with each other, being placed on opposite sides of the stem. Ex. many running vines.

Fig. 68.



Interruptedly pinnate, Fig. 68, when the leaflets are alternately large and small. Ex. Silver weed, (*Potentilla anserina*.)

Fig. 69.



Bipinnate, Fig. 69, doubly winged, when a common petiole bears pinnate leaves on each of its sides. Ex. Mountain spignell, (*Athamanta libanotis*.) Mimosa arborea.

When is a leaf said to be unequally pinnate? When abruptly pinnate? When alternately pinnate? When bipinnate? "

Fig. 70.



Tripinnate, Fig. 70, three times winged, when the common petiole has bipinnate leaves on each side. The figure shows a tripinnate leaf ending with an odd one. Ex. Angelica tree, (*Aralia spinosa*.)

With respect to the *position* of the leaf, the following distinctions are made, viz. .

Fig. 71.



Erect, Fig. 71, (upright,) when the leaf forms a very acute angle with the stem. Ex. pointed Rush, (*Juncus articulatus*.) Cat's tail, (*Typha latifolia*.)

Fig. 72.



Horizontal, Fig. 72, (spreading,) when the leaves are parallel with the horizon, and form right angles with the stem. Ex. Wild lettuce, (*Lactuca sylvestris*.) Boneset, (*Eupatorium*.)

Fig. 73.



Reclined, Fig. 73, (reflected,) when the apex falls down so as to be lower than the insertion of the petiole. Ex. Grass leaved Groundsel, (*Senecio reclinans*.)

When is a leaf said to be tripinnate? With respect to its position, when to be erect? When horizontal? When reclined?

Fig. 74.



Oblique, Fig. 74, (twisted,) when the base of the leaf is turned upwards, while the half towards the apex is horizontal, or inclining downwards. Ex. Crown Imperial, (*Fritillaria obliqua*,) Cel's Tulip, (*Tulipa Celsiana*.)

With respect to the situation and insertion of the leaves, that is, their places in relation to each other, and the manner in which they are connected with the stem, or petiole, the following distinctions are made.

Fig. 75.



Radical, Fig. 75, (root leaves,) when they proceed directly from the root, generally around the stem, but never growing on it. Ex. Dandelion, Side-saddle flower, (*Sarracenia purpurea*.)

g. 76

Alternate, Fig. 76. Leaves are alternate when are inserted one after the other on opposite sides of the stem. Ex. Large Pinweed, (*Lechea major*,) (*Prenanthes alba*.)

Fig. 77.



Opposite, Fig. 77, one against the other, when they are inserted at opposite points, on each side of the stem, or petiole. Ex. Sage, (*Salvia*,) Monkey flower, (*Mimulus ringens*.)

In the majority of annual and herbaceous plants the leaves are opposite.

When oblique? With respect to situation when are leaves radical? When alternate? When opposite?

Fig. 78.



Stellate, Fig. 78, (*verticillate*,) or whorled, when the leaves grow in a circle around the stem. Ex. Bedstraw, (*Galium*.) Turk's-cap Lily, (*Lilium martagon*.)

Fig. 79.



Peltate, Fig. 79, (target-shaped,) where the foot-stalk is inserted into the middle of the leaf, on the under side, like the arm of a man holding a shield. Ex. Common Nasturtium, (*Tropaeolum majus*.) *Geranium peltatum*.

Fig. 80.



Perfoliate, Fig. 80, (leaf-pierced,) when the stem runs through the leaf, or the leaf surrounds the stem, without any opening. With respect to the stem this has already been noticed. Ex. Bellwort, (*Uvularia perfoliata*.)



Amplexicaul, Fig. 81, (stem-clasping,) when the leaf surrounds the stem, except on the side opposite to the apex. Ex. Several species of Solomon's seal, (*Conrallaria*.) Also several of the star-worts, or asters.



Vaginant, Fig. 82, (sheathed,) when the base of the leaf is formed into a tube which surrounds the stem. Ex. Most of the grasses.

When are leaves stellate? When peltate? When perfoliate? When amplexicaul? When sheathed?



Connate, Fig. 83, growing together at the base, so as to appear like one leaf. Two opposite, amplexicaul leaves form the connate. Ex. Monkey flower, (*Mimulus ringens*.)

OBSERVATIONS ON THE LEAVES.

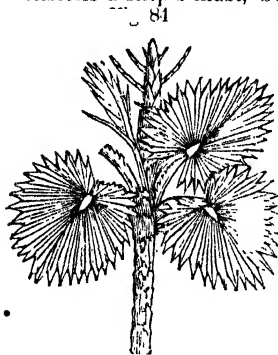
The leaf is most commonly a temporary part of the plant, originating with the young branch which supports it, or from which it grows. With the exception of evergreen plants which retain their foliage in cold climates during the winter, the leaves shoot forth in the spring, flourish during the summer, and perish and fall to the ground towards the close of autumn. A great proportion of the beauty of trees, as well as much of the comfort they confer on man and animals, arise from their leaves. To the plants themselves they are of the utmost importance, being the organs by which they absorb from the atmosphere a portion of their nourishment. The leaves of plants decompose the air, and hence they perform a similar function in the economy of vegetation, that the lungs do in the animal economy. They are also the organs by which the plant perspires, thus performing the same office for the plant that the skin does for the animal. The pores by which the perspiration is emitted are on the under sides of the leaves.

The leaves are much more diversified in form, texture, and composition than any of the other vegetable organs. We have seen, though in a limited degree, how they differ in form, surface, situation, direction, distribution, and number. Some leaves are of immense size; while others are so small as hardly to be distinguished by the naked eye. But there appears to exist no proportion between the size of the leaf and that of the tree to which it belongs. Thus the leaves of the Oak, Birch, and Elm, though large trees, are not the fifth part so large as those of the Skunk Cabbage, (*Pothos fatida*), or Burdock, (*Arctium lappa*.) It is possible, however, that in most cases their number may compensate for their diminutive size. Thus we may observe that where the leaves are small, as in the Pine, Heath, Myrtle, and many other species, they are immense-

When connate? Is the leaf a permanent or temporary part of the plant? In what respect are the leaves of plants like the lungs of animals? In what respect are they like the skin of animals? Does there exist any proportion between the size of the leaf and that of the tree?

ly numerous; while the Bass-wood, (*Tilia*,) Chestnut, and other trees whose leaves are comparatively large, have also in comparison, few in number.

Among perennial plants, or trees, the *Pine* genus has the smallest, and the *Palm* genus the largest leaves. Most of the latter tribe are furnished with leaves of great size, some of them being of such dimensions as to astonish the stranger. Among trees which produce such leaves is the Fan palm, (*Corypha umbraculifera*,) which grows in the island of Ceylon, and other eastern countries, where it is called *Talipot* tree. This tree is said to exceed in size and dimensions a ship's mast, bearing its leaves only at the top.



When plaited, or folded together, as they are when young, the whole leaf is not much larger than a man's arm; but when spread, they are heart-shaped, as represented by Fig. 84, the largest being twenty feet long, and fifteen broad. These leaves are employed for many purposes by the natives of hot climates. The soldiers and others cut them into triangular pieces, which they lay on their heads to protect them from the sun, or shelter them from the rain. When on a march these leaves form the tents under

which the soldiers encamp, and the huts under which the travelling natives sleep. They also serve for paper on which the natives write. The tree bears no fruit until the last year of its life, when it puts forth yellow blossoms from its top, most lovely to behold, but which smell so strong and disagreeable, that when it grows near their houses, the people cut it down before it blossoms. The fruit is a hard seed, no larger than a cherry, and not fit to eat, but the trunk contains a pith which the natives beat in a mortar, and of this they make cakes, which taste not much unlike white bread.

We have remarked that leaves serve very important purposes in the economy of vegetation, and that they perform

What tribe of plants have the smallest, and what the largest leaves? What is said of the size, and the uses of the fan palm?

the double offices of absorbing and emitting both fluids and gases. The effects which the leaves of plants produce on the air they absorb, or inhale, has been the subject of very laborious experiments. The *chemical* changes which have been ascertained to be thus produced are too important not to be noticed in this place. "The most important chemical phenomenon," says Professor Lindley, "connected with the growth of plants, is the property possessed by their leaves, or green parts, of absorbing and parting with carbonic acid in the dark, and parting with their oxygen under the influence of the sun."

"No plant can long exist [live] in which an alternate absorption and expulsion of oxygen does not take place, except the Fungi [mushrooms.] The expulsion of oxygen is determined by the quantity of light to which the plant is exposed. Light causes the decomposition of the carbonic acid gas, and the accumulation of solid matter [in the plant.] Hence if a plant is exposed to too strong a light, it generally perishes from the excessive expulsion of oxygen. And if it is not exposed to the influence of light, it dies from the accumulation of that principle. If there is too great an accumulation of oxygen, an attempt will always be made by the plant to reach the light, for the purpose of parting with the superfluity; as in seeds which in germination shoot from darkness into the light. If this cannot be effected, etiolation [whitening] first takes place, which is caused by the accumulation of oxygen, and the consequent non-deposition of carbon, and death succeeds."—*Natural System*.

From these principles, or rather from experiments on which these principles have been founded, we learn that if a plant be confined to a close vessel in the dark, containing a certain portion of atmospheric air, the vegetation of the plant will convert the oxygen which the air contains (being 20 parts to every 100 of the whole) into carbonic acid. This change the leaves effect during the absence of light, by first absorbing the oxygen, which then combines with a portion of the carbon, contained in the leaf, after which the compound gas is expelled, and thus the oxygen the vessel contained is converted into carbonic acid.

If now the plant is exposed to the direct rays of the sun in the same glass vessel, and containing the carbonic acid,

What are the most important chemical phenomena produced by the leaves of plants? Under what circumstances do plants emit and absorb oxygen? When does a plant convert oxygen into carbonic acid?

(which gas is composed of carbon and oxygen,) this gas will be absorbed, but the carbon will be retained to increase the growth of the plant, while the oxygen gas will be returned, and thus that portion of the air which was converted into carbonic acid during the night, will be reconverted into oxygen gas again during the day.

These surprising changes, which are performed by the vital powers of the plant, or during its growing state, are supposed to be the means, at least in part, by which plants increase; for by other experiments it has been found, that when any growing vegetable is confined in a portion of carbonic acid, made by art, the carbon is absorbed and retained, while the oxygen is returned.

Now it is also known by experiments that the atmosphere always contains a portion of carbonic acid gas, and that the solid part of vegetables growing in the open air, is chiefly carbon. From these facts it is inferred that the increase, or growth of plants depends much on the carbon which they absorb from the atmosphere, in the form of carbonic acid, the oxygen being emitted, while the carbon is retained.

If there is too great an accumulation of oxygen, as when a plant is kept in a dark place, then it will grow towards the nearest ray of light, which if it does not reach, it will remain white, or etiolated, and sickly. In this state, as when a potato shoots out its stem in a cellar, plants contain little carbon, being chiefly composed of water and sap, but as soon as they gain the influence of the sun, they begin to part with oxygen, increase their quantity of carbon, and assume a green and healthy aspect. These circumstances seem to explain the reason why many kinds of fruit, when gathered green and laid in the sun, soon part with their harsh sour taste, and become mild, sweet, and agreeable, or in other words, *ripen*. By the influence of the light, their superabundance of oxygen on which their acerb taste depended, is expelled, and at the same time the carbonaceous matter and the essential oil, on which their agreeable flavor depends, are increased. That these changes are produced by the influence of light, and not by the heat of the sun

When does a plant convert carbonic acid into oxygen? In what manner are the solid parts of vegetables accumulated? Why do plants growing in the dark remain white and sickly? In what respect is the composition of such plants deficient? Why do green fruits laid in the sun become sweet and pleasant to the taste?

The *irritability* of plants, as indicated by their leaves, and sometimes by their flowers, also presents a subject of curiosity and interest. Many flowers collapse, or close their petals during the night, or when carried into a dark place during the day. Some are so sensitive as to begin to collapse whenever the sun is obscured by a cloud, even for only a few minutes, and expand again as suddenly, when the light becomes strong. This collapse is called the sleep of plants.

The Sensitive Plant, (*Mimosa sensitiva*,) possesses this property to an uncommon degree. Its branches, or leaves, on being touched with the finger, instantly begin to retire. The branch drops down from its erect position, while its leaves fold themselves closely together. The same effect is produced on withdrawing the light, or during the darkness of night. It is said that a highly interesting effect is produced on conveying a strong light into a room containing Sensitive Plants during the night. They soon begin to indicate by their motions, that they are disturbed in their sleep, and as they awake, their branches and leaves, from being in a collapsed and torpid state, become erect, as

What part of the leaf performs the office of absorption and emission of fluids? How is it proved that these offices are performed by the under surface of the leaf? What is meant by the irritability of plants? What plant is peculiarly irritable? What is said to be the effect of carrying a strong light into a dark room containing sensitive plants?

The *fall* of the leaf appears to be intimately connected with the irritability of the plant. This takes place in some plants earlier in the season than in others. In general, perennial plants, or trees, begin to drop their leaves about the middle of autumn. This is preceded by a change of color, indicating that their vegetating powers have become exhausted, and that their irritability, or vital energies, have ceased to act, at least for the season. This process is rapidly increased by the accession of frost, which, in a single night, by stopping entirely the motion of the sap into these organs, often leaves them perfectly dead in their places, and by the morning breeze, the tree is totally stripped of its foliage.

The different colors which the different species of forest trees assume at this season, afford to the eye, one of the most "splendid objects of an autumnal landscape," while to the mind of a rational being, it ought to become the subject of deep and profitable contemplation. The change which the leaf undergoes, and its "*fall*," is but an illustration of the state of all mortal beings, and a type of their final descent to the grave. Disease, or old age, will as certainly exhaust the vital powers, and destroy the irritability of man, as the autumn, and the frost, do that of the leaf, and like it, we must all, sooner or later, fall to the ground, and "return, dust to dust."

In general, trees which put forth their leaves earliest in the spring, begin to lose them earliest in the fall, though this is not universally the case. Evergreen trees, such as Laurel, (*Kalmia*,) and Rosebay, (*Rhododendron*,) do not let fall their leaves during the usual season, but preserve their green foliage during the winter and through the year.

In what manner do poisons operate on plants? How is the fall of the leaf connected with the irritability of plants? Is there any proportion between the time in which trees put forth their leaves in the spring and lose them in the fall?

These species throw off their leaves gradually, one after another, while new ones spring forth to supply their places. All plants, therefore, whether annual, perennial, or evergreen, shed their leaves. In annual, or deciduous plants, these organs are produced only for the season, and having performed the functions for which they were designed, decay and fall to the ground; while in evergreen plants, these parts being designed for a different, or more extensive purpose, are supplied with new leaves as fast as the old ones decay. There is however a difference in this respect, depending on the climate where the same species are cultivated. Thus some plants which are deciduous, or lose their leaves in our climate, become evergreens when removed beyond the reach of frost, or are protected in a green-house. The Kidney bean, (*Phaseolus*,) becomes an evergreen when protected from the frost.

Botanists have offered various reasons with respect to the cause which produces the fall of the leaf. The opinion of Sir James E. Smith, on this subject, is perhaps the most simple and satisfactory, and at the same time has the advantage of being easily understood. He supposes that this phenomenon arises merely from the *sloughing* of the diseased, or dead part, on the same principle that a separation takes place between dead and living flesh. Every one knows that if he crushes the end of his finger, so as to destroy the vitality of that part, a separation will take place between the dead and living flesh. This effect is produced by the vital action of the sound flesh, which thus removes the lifeless and offensive part, and finally restores the injury by producing a new part in the place of that which was dead. The same effect appears to take place with respect to the dead leaf.—A separation takes place between the lifeless petiole, and the living branch of the tree, by the vital action of the latter, and in consequence of which the leaf is cast off, to be renewed again the next year. That this is the true solution seems to be proved by the circumstance, that if a tree be cut down, or its life otherwise destroyed, when covered with leaves, no separation takes place, because the vital action of the tree has ceased, and the leaves wither in their places but do not fall.

Do evergreen trees cast off their leaves? What is said of the effect of climate in producing the fall of the leaf? What is the opinion of Sir James E. Smith with respect to the cause of the fall of the leaf? When the life of a tree is destroyed in the summer, why do not its leaves fall?

Before leaving this subject, we will notice two or three curious leaves, which have not yet been mentioned.

There are a few species of plants which produce leaves in the form of hollow cylinders, or cups, and which were undoubtedly intended by the Great Author of nature to contain water, either for the nourishment of the plants themselves, or for the sustenance of men, or animals.

Fig. 85.



The Chinese Pitcher plant, (*Nepenthes distillatoria*,) Fig. 85, is among the most extraordinary receptacles of this kind. It grows in the East Indies, as well as in China. The tree is an evergreen, and bears that kind of flower which botanists call a panicle. The leaves are sessile, or joined to the stem without the intervention of a petiole. At the end of the leaf there is an elongation of the midrib, like a tendril, six or eight inches long. The extremity of this, swells into a hollow cylinder, or cup, as seen in the figure, and hence the name Pitcher plant. This cup commonly contains nearly half a pint of very pure water. It is furnished with a kind of lid, and hence it is most probable that the water is produced by the action of certain organs of the plant, designed for this purpose, and that it is not the product of rain. In Ceylon, where this plant is common, it is called *monkey cup*, because these cunning animals, when thirsty, and there is no stream at hand, open the lid and drink the contents. Men, also, when travelling, or hunting in the woods, often find the water of this pitcher an agreeable means of assuaging their thirst.

The Bladder Tillandsia, (*Tillandsia utriculata*,) is also a reservoir of water. This plant is a parasite, that is, it lives and grows on other trees, without descending to the earth for its nourishment. Its seeds are carried about by the wind, and stick to other trees, especially decaying ones. Here they germinate, and send out small fibres, which take hold of the bark, and then weave themselves together into a mat of considerable size and strength. From this foundation there arise several leaves, like those of the Aloe, or Pine Apple. These are folded, or enclosed, one within the other, forming a bundle several feet long, on the inside of which there is a hollow cavity, capable of holding a quart

What extraordinary form has the Chinese pitcher plant? In what manner does the tillandsia retain and preserve water for the use of man?

of water. The rain, during the wet season, falling on the spreading leaves, runs down in their small channels into this cavity, or bottle, and as the leaves touch each other on all sides, evaporation is almost entirely prevented. The water is therefore retained until the dry season, when it often affords timely relief to the thirsty traveller, in the hottest and driest parts of South-America and the West-Indies. The traveller, Dampier, speaking of this plant, says, "we stick our knives into the leaves, just above the root, and that lets out the water, which we catch in our hats, as I have done many times to my great relief."

We have one native plant growing in the peat bogs of New-England, whose leaves hold water. This is the Side-saddle flower. Its botanical name is *Sarracenia*, which it derived from Dr. Sarazin, of Quebec, who first sent it to Europe about 1752. Its common name is derived from the resemblance of its stigma to a woman's pillion. The stem rises a foot high, and bears a singular, but beautiful purple flower. The leaves, which are hollow, are from four to eight to each root, and surround the stem like radii from a centre, and rest on the ground. They are of an oblong form, swelling in the middle and gradually contracting to form the foot-stalk. Their open mouths, which are of considerable size, are somewhat elevated, and contracted at the border, so that in the natural position they retain the water when nearly full. And on the lower side of the mouth there is a broad spreading appendage, which catches the water and directs it into the cup. These cups contain a wine glass of water, and unless pierced by some insect, are seldom empty.

ARMS, OR APPENDAGES OF PLANTS.

Besides the essential parts of a perfect plant, such as the root, stem, leaves, &c., many species are furnished with arms, or appendages, which are peculiar to themselves, and are entirely wanting in other species. These appendages, Linnæus called *Fulcra*, or props, though this name applies only to such of them as help to sustain or support the plant. The number of these appendages commonly enumerated, is seven, and are known by the following names, viz: *Stipule*, *Bracte*, *Thorn*, *Prickle*, *Tendrils*, *Gland*, and *Hair*.

Whence does the plant *sarracenia* derive its two names? What are the peculiarities of the side-saddle flower? What are meant by the arms or appendages of plants?

Fig. 86.



Stipula, or stipules, Fig. 86, are leafy appendages, to the proper leaves, or their foot stalks. They are commonly smaller than the principal leaves, and are situated at their bases in pairs. In some plants these parts soon fall off, but in others they continue as long as the leaves themselves. Examples are seen in the Rose, Pea, Wild Cherry, and Garden Violet. In the latter plant they are as large as the proper leaves, and are readily distinguished by their lyrate-pinnatifid shape, while the leaves are oblong and serrate. The shape of this part is very different in different plants.

Fig. 87.



In the grasses it is situated within the leaf, and is of the shape represented by *d* Fig. 87. Its situation is nearly peculiar to each species where it exists. In a great proportion of plants it is wanting entirely.

Fig. 88.



Bracts, or Floral leaves, Fig. 88. This is a leafy appendage to the flower, or its foot-stalk, and is of a variety of forms and colors. It is not situated like the stipule at the bases of the leaves, but on the peduncle of the flower. It is much smaller than the true leaf, and is at a distance from it. In some plants it falls off with the leaf, while others it remains after the leaf and flower have fallen. In the Lime Tree, or Bass-wood, (*Tilia Europea*,) it remains during the whole winter. In one species of Sage, (*Salvia sclara*,) it is sometimes difficult to distinguish this part from the true leaves. In the Painted cup, (*Euchroma coccinea*,) it forms the only beautiful part of the flower.

What are the stipules of plants? Are the stipules found in similar situations on all plants? What are the bracts? Where are the bracts situated?

Fig. 89. **Thorn or spine, Fig. 89.** This is a well known and sometimes very troublesome appendage. It originates in the wood of the plant, with which it forms a part. It is sometimes found on large trees, as the Honey-locust, (*Gleditschia*), but is more common on shrubs, as the common Thorn bush. In some species this part disappears by culture, as in the Pear tree. Hence Linnæus denominates such plants as *tamed*, or deprived of their natural ferocity.



Fig. 90. **Prickle, Aculeus, Fig. 90.** This part arises from the bark only, as in the Rose and Briar, and does not disappear by cultivation. If the bark be stripped from the Rose stem, the prickles come off with it, but if stripped from the thorn bush, the thorns will remain attached to the wood; a proof that thorns are attached to the wood, and prickles to the bark.



Fig. 91. **Tendrils, or Clasper, Fig. 91.** This is the true fulcrum, or support of many plants, being designed to sustain weak and climbing stems, which have not sufficient strength to support themselves. The tendril proceeds either from the side of the stem, as in the Gourd, from the end of the leaf as in the *Gloriosa superba*, or sometimes from the end of the flower stalk.



The tendrils of the Gourd, and of most other plants, are at first straight, and appear to reach forward for the purpose of finding some support on which to lay hold. After having taken hold of some support, they soon make several turns around it, and then coil themselves into the form of a spiral spring, so that when the wind blows, they have an elastic attachment which often prevents their being torn from their places. The tendrils of the Gourd will remain straight and reaching for several days, unless they sooner find something to entwine themselves around; while if a twig be placed within their reach, they will make several turns around it in as many hours. Few plants exhibit the uses or beauty of this part so strikingly as the common Gourd. In some plants the foot-stalks of the leaves perform

Does the thorn originate in the wood, or in the bark? How does the prickle differ from the thorn? What is the use of the tendril, or clasper? From what parts of the plant do the tendrils proceed? What plant is mentioned as showing in a peculiar manner the use and beauty of the tendril?

the office of tendrils, as in the common Nasturtion, and Virgin's bower, (*Clematis Cirrhosa*.)

Fig. 92.



Gland, Fig. 92. This is a small tumor which discharges a fluid that is either *resinous*, *oily*, or *saccharine*. It is situated on various parts, as on the back of the leaf, on the petiole, or sometimes between the notches of the leaves. Some glands are raised from the surface by little foot-stalks, as at *g* in the figure, where they are situated on the petiole, and appear like small tubercles. Others are hardly raised

above the surface, appearing like dots, scales, or minute bladders, as in the leaves of the Plum, and Peach. The Moss rose owes its peculiarity of appearance, about the calyx and flower-stalk, to its glands.

Pubescence. This term includes the clothing of plants, such as hair, wool, bristles, stings, &c. These slight appendages differ considerably from each other in form, softness, color, and other particulars. Their individual names are taken from some well known substance, or thing which they are supposed most nearly to resemble. Thus the clothing of the Mullein is *woolly*; that of the *Primula villosa*, is *velvety*; that on the under side of the Colt's foot, (*Tussilago*,) is *downy*; while that of the common Nettle is *prickly*.

THE FLOWER.

Having described the different parts of a plant from the root upward, we come now to describe the *flower*. This part, which is the chief object of culture to the florist, is equally important to the scientific botanist, since on it depends the distinction and systematic arrangement of the plant to which it belongs.

It is obvious that flowers consist of several parts which differ from each other in respect to color, shape, hardness, durability, and texture. The beauty of this part as a whole,

What are the glands of plants? What are the appearances of glands, and where are they situated? On what account is the flower of importance to the Botanist?

indeed depends in a great measure on the variety of color and shape which the different parts present. Thus the red **Rose** would lose much of its beauty, were its centre colored red instead of yellow, and were this part formed of petals instead of stamens and pistils. Nor could the **Passion** flower claim such pre-eminence among the beauties and singularities of the garden, did it not possess, in addition to its contrast of colors, such peculiarities in the forms of its different parts. Now botanical descriptions depend to a certain degree on the differences which the parts of different flowers present, and therefore it is necessary that each part should have its appropriate name, so that it may be distinguished from all other parts. No two flowers of different classes exactly resemble each other, for were this the case, they would belong to the same species. It is the difference in their forms and number, and situation of their corresponding parts, that forms the basis of their scientific arrangement into classes, orders, &c. As we proceed, we hope to make this important part of botany both interesting and easily comprehended.



Fig. 93. *Calyx*, Fig. 93. The Calyx or flower cup, is the external part of the flower, or the cup in which the petals are placed. It is generally of the color of the leaves, which it also resembles in texture.—

This part has a great variety of forms in the different genera, and in accordance has received several appropriate names, which will be explained in their proper places. Sometimes the calyx consists of several distinct parts or leaves, called *sepals*, and sometimes it consists of only a single piece, when it is called *monophyllous*, or single leaved, from *monos*, one, and *phyllon*, a leaf. The calyx here represented is *monophyllous*, and five parted; that is, it consists of five parts above, which are all united at the base. **Ex. Bugloss**, (*Anchusa*,) **Tobacco**, (*Nicotiana*.) In the **Lily** and several other genera, the calyx is wanting.

On what does the beauty of the flower depend? What part of the flower is the calyx? What are the leaves, or distinct parts of the calyx called? When is the calyx called *monophyllous*?

• Fig. 94.



Corolla, Fig. 94. This is the delicate, colored part of the flower, generally consisting of several pieces called *petals*. It is situated within the calyx, and constitutes the chief beauty of the flower. In the red Rose, the corolla is red, and consists of a great number of petals. In the Morning Glory it consists of only a single piece, and is of various colors, as blue, red, or white.

Fig. 95.



The Calyx and Corolla are represented in their natural positions with respect to each other by Fig. 95. The calyx occupies the inferior and outer portion of the flower, being the part to which the stem is joined, and in which the corolla is placed. When the corolla consists of a single piece, it is called *monopetalous*. When the corolla is inserted, or comes out below the germen, it is said to be *inferior*, and when above the germen it is said to be *superior*.

Fig 96.



Stamens, or Stamina, Fig. 96. The stamens consist each of two parts, viz. the *anther*, *a*, and the *filament*, *b*. The filament merely serves to elevate the anther, and is not an essential part of the flower, being absent in many species. The anther is an essential part, as it contains the *pollen*, or dust, without the influence of which, the species are not perpetuated, or in other words the seeds will not grow.—When the filaments are wanting, the anthers are situated on the germen, or are attached to some other part of the flower, as the corolla.

What part of the flower is the corolla? Which is the calyx, and which the corolla, in Fig. 95? When is the corolla monopetalous? When is the corolla inferior, and when superior? Of how many parts does each stamen consist? Where is the anther situated? What is the use of the anther?

Fig. 97. *Pistil*, or *Pistillum*, Fig. 97. The *Pistil* consists of three parts, viz. the *germen*, or seed bud, *a*, which is the rudiment of the young fruit, the *style*, *b*, which is attached to the germen, and serves to elevate the stigma, and the *stigma*, *c*, which like the anther is indispensable. In some plants the style, like the filament, is wanting, the stigma being attached immediately to the germen.

The form, colors, consistence, size, and duration of these parts are exceedingly various in different plants, but after a little practice the pupil will find little difficulty in distinguishing them in most of the perfect flowers.

Fig. 98. The positions in which the *stigma*, *style*, *anthers*, *filaments*, and *germens* are placed with respect to each other, in the White Lily are represented by Fig. 98. All these parts, it will be observed, are internal with respect to the corolla, the pistil being in the centre of the whole.—Around the pistil, and between it and the corolla, stand the stamens. The stigma is placed on the summit of the style, as the anthers are on the tops of the filaments, while the germen is placed at the lower extremity of the style, and in the midst of the filaments.



Fig. 99.

Having thus described each most important part of a flower separately, so that the pupil might be enabled to distinguish them as individuals, the whole with the exception of the calyx are brought together in Fig. 99, forming that well known flower the White lily. In this genus the calyx is wanting, and therefore could not be properly represented as one of its parts. Its situation, when present, will be understood by Fig. 86.

Of how many parts does the pistil consist? What parts of the stamina and pistila are essential? Explain the positions in which the stamens, pistil, style, anthers, and stigma are situated with respect to each other in the lily? Point out all the different parts of the flower, as represented by Fig. 99.

We have described and illustrated only the most simple and common kinds of corolla and calyx. In the different genera, these parts are almost infinitely diversified, and it therefore becomes necessary to illustrate these parts more particularly, and also to describe some parts belonging to the flower and fruit which have not yet been mentioned.

CALYX.

The Calyx has received different names, depending on its situation and form.

Perianthium, or *Perianth*. This term is derived from the Greek *peri*, about, and *anthos*, a flower. It is the calyx, or flower cup, properly and commonly so called. It makes a part of the flower, being always contiguous to the petals, which it surrounds. The fine green leaves which are rolled back under the spreading petals of the full blown Rose, form the calyx of that flower.

Fig. 100.



We have stated that this part is called monophyllous when it consists of only a single leaf. The Pink, Fig. 100, is an example of a monophyllous perianth. The calyx, *a*, forms only a single piece, though divided above into several parts. The small leaves, *b*, which embrace the base of this calyx, are called *scales*. In the Pink, therefore, the calyx is a perianth. It is also *inferior*, being placed below the germen, or the germen being included within the cup.

Fig. 101.



Involucre, Fig. 101, *Involucrum*.— This calyx is remote from the flower, which, therefore, it never embraces, or surrounds like the perianth. It most commonly consists of a number of small leaves which surround the stems of umbelliferous plants, as Dill, Parsnip, and Fennel. The Involucre is said to be *universal* when it surrounds the stem of several partial umbels, as at *a*, and *partial* when it surrounds the peduncles of the flowers, or florets, as at *b*. The involucre of compound flowers will be described hereafter.

When is the calyx called a perianthium? Give an example of a monophyllous perianth. What is meant by a partial, and what by an universal involucre?

Fig. 102.



Ament, Fig. 102, *Amentum*, or *Catkins*.— This consists of many chaffy scales, attached to a thread, which is the common receptacle, or part which connects the whole together. These scales are the calyxes of the small flowers or florets which they cover and protect. Each scale, with the parts which it protects, may therefore be considered as a distinct flower. In some Catkins there are both stamens and pistils, but more commonly the stamens are in one and the pistils in another. In the Willow, (*Salix*,) Walnut, (*Juglans*,) and Chestnut, (*Castanea*,) the flowers are contained in Catkins. In most cases these parts fall off soon after the time of flowering, as in the trees above named; but in a few instances they remain on the tree, enlarge, and protect the seed as well as the flowers, as in the Pine, and Fir tribe.

Fig. 103.



Spathe, Fig. 103, *Sheath*. Some flowers before their petals expand, are enclosed in a covering, which bursts longitudinally at the time of flowering. The membrane so enclosing the flower, is called a spathe or sheath. The flower stalk continuing to grow, leaves this part below it, forming the kind of calyx shown in the figure. The Daffodil, Onion, and Tiger flower, are examples. When the part which protrudes from the spathe, is an elongated receptacle, it is called a *spadix*, as in the Calla Ethiopica, and Indian turnip, (*Arum*.)

Fig. 104.



Glume, Fig. 104, a *Husk*. This is the calyx of the grains and grasses. In some species it is composed of a single piece only; in others of two pieces, as here represented, and in others of four pieces. In the language of Botany, these pieces are called *valves*. Thus the glume of the oat is two-valved. To the glume is often attached the beard, or *awn*, a bris-

What is an ament or catkin? What flowers are contained in catkins? What are the parts of plants meant by spathe and spadix? What is a glume? What are the pieces composing a glume called?

tle shaped appendage. This is sometimes spiral or twisted, and possesses the property of an *hygrometer*. This is the case with the awns of the Wild or Hygrometic oat, (*Avena sterilis*,) which are employed to construct an instrument designed to indicate the degrees of moisture and dryness.

Fig. 105.



For this purpose the middle part of the awn, Fig. 105, which is twisted, or formed like a screw, is used, one end being cemented to the centre of a circular plate, which is marked off into degrees; to the other end is attached a bristle as an index, or hand. The whole being covered with a glass, forms the hygrometer, or moisture measurer. When the weather is damp or rainy, the awn untwists and moves the hand in one direction but as the atmosphere becomes dry, it ceases at first to move, and then turns in the contrary direction. The moisture of the hand will set these

awns in motion, making them appear like living animals.

Fig. 106



Volva, Fig. 106, Wrapper. This is the membranous covering of some of the Fungus or Mushroom tribe, while young. The membrane, as the vegetable increases in size, finally bursts, and afterwards contracts and dries, forming a kind of ring around the stipe, or stem of the Mushroom, as represented in the figure.

Fig. 107.



Calyptra, Fig. 107, a Cap, or Hood. This kind of calyx is found only among the mosses. It is the cap or veil which covers the fructification of many of that tribe. The shape is conical, resembling that of an extinguisher, or thimble. These plants are very common in the woods, and among rocks, growing an inch or two high.

What philosophical instrument is made by means of the awn of the hygrometic oat? What part of a mushroom is the volva, or wrapper? What part of a moss is the calyptra, or hood?

The kinds of calyx, which we have described are the most important that botanical writers enumerate. They are seven in number, viz. *Perianth*, *Involucre*, *Ament*, *Spathe*, *Glume*, *Volva*, and *Calyptra*.

These parts, especially the *Perianth*, *Ament*, and *Spathe*, are exceedingly various in their forms and situations, so that the pupil will often be at a loss concerning them. "In a considerable number of plants, the perianth is *deciduous*, by which is meant that it continues with the flower, and drops off along with it, or when it begins to wither: in others it is *caducous*, or falls off before the flower. In the greater number, however, it is *permanent*, that is, it remains after the flower has disappeared, and until the fruit is perfected. At the base of a pea-pod, for instance, the perianth is as perfect as it was in the blossom, and in many species it continues, forming a kind of case, or capsule, protecting the seeds, as in the Henbane, (*Hyocyamus*.)"

The brownish withered leaves surrounding the cavity in the base of an apple, or pear, are the remains of that variety of calyx called the perianth. In the Peony, when in blossom, the perianth may be observed, including not only the stamens, and pistils, but the fruit, or seed vessel also. In the Poppy, the calyx, which is a perianth, falls off before, or soon after the flower expands. Before flowering, the petals of this plant are enclosed in its calyx, consisting of two large green leaves, which are not to be found when the flower is fully expanded, having dropped to the ground.

We have said that in some plants the calyx is entirely wanting, as in the Lily. In other instances it forms the most highly colored, and showy part of the flower, and in others it serves as the seed vessel, as in the Catnip and Hysop. In the Hollyhock, the calyx is double, and, in the Thorn-apple, (*Datura*.) this part separates transversely, the upper part falling off, while the lower remains attached to the young fruit.

COROLLA.

We have already seen that the corolla is the most delicate, highly colored, and conspicuous part of the flower.—In relation to the calyx, it is the inner part, or whorl.—

How many kinds of calyx have been described? What is said of the proportion which exists between deciduous and permanent calyxes? What is said of the calyx of the poppy?

When two or more whorls are developed, the outer is called the *calyx*, the inner the *corolla*.

The corolla, like the calyx, is exceedingly various in its form and appearance, and therefore requires to be further described and illustrated.

When the corolla consists of only one piece, or petal, it is called *monopetalous*, or one petalled. If it consists of more than one petal, it is termed *polypetalous*, or many petaled. In many instances monopetalous corollas appear to be polypetalous, because their divisions reach nearly to the base, and each section stands as a distinct petal. But however deeply the corolla is divided, if the petals adhere to each other at the base, and there form a ring, or tube, it is monopetalous. To ascertain this, it is often necessary to dissect the flower, or pull it in pieces.

Fig. 108.



A monopetalous corolla, Fig. 108, consists of two parts; the *tube*, *b*, or cylindrical part, which is often enclosed within the calyx, as in the Primrose, and the *limb*, *a*, which is the spreading portion of the same flower.

The following are among the most common forms of this kind of corolla.

Fig. 109.



Campanulate, Fig. 109. Bell-shaped, having the shape of a bell, that is, it swells suddenly at the base, and has no perceptible tube or elongation there. Ex. Bell-flower, (*Campanula*.)

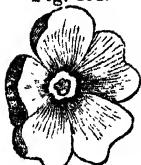
Fig. 110.



Funnel shaped, Fig. 110, Infundibuliform.—It is shaped like a funnel, the base being small like a tube, and gradually swelling upwards like an inverted cone. There are many different varieties of this form. Ex. Tobacco, (*Nicotiana*,) Morning Glory, (*Ipomœa*,) Henbane, (*Hyoscyamus*.)

When two or more whorls are developed, which is the calyx and which the corolla? When is the corolla monopetalous? When is the corolla said to be polypetalous? What part of the corolla is the *limb*, and what part is the *tube*? What is the form of a campanulate corolla? How is a funnel-shaped corolla formed?

Fig. 111.



Wheel-form, Fig. 111, rotate, having the form of a wheel, the limb of the corolla spreading with a very short, or no perceptible tube. The Fifth Class presents many examples of this kind of corolla. Ex. Borage, (*Bo-*
Red Pepper, (*Capsicum*,) Loosestrife, (*Lyfimachia*.)

Fig. 112.



Labiate, Fig. 112, or ringent, irregular, and gaping like the mouth of an animal. It consists of a single petal divided obliquely into two irregular parts, called the upper and lower lips, *a*, *b*. When the lips are widely separated, it is called *ringent*. When the lips are closed by an appendage, or kind of palate, it is called, a *personate* corolla, from *persona*, a mask. Ex. Sage, (*Salvia*,) Lavender, (*Lavendula*,) Catmint, (*Nepeta*.)

It is a circumstance worthy of notice, that this tribe of plants, with few exceptions, are either tonic, aromatic, or cordial in their qualities. Several of them, as Sage and Lavender, contain considerable quantities of camphor.

Fig. 113.



Salver-shaped, Fig. 113. *Hypocrateriform*. Having the border spread out horizontally, and ending in a tube. Ex. Primrose, (*Primula*,) Narrow leaved Laurel, (*Kalmia angustifolia*,) Lichnidia, (*Phlox*.)

POLYPETALOUS COROLLAS.

Any corolla composed of more than one petal, is termed *polypetalous*.

Fig. 114.



The petals of polypetalous corollas consist of an elongated, or long narrow part, *f*, called the *claw*, and by which it is attached to the calyx, and an expanded and commonly more highly colored portion, *a*, called the *border*.

What is the form of a rotate corolla? Give an example of a labiate corolla. How is the salver-shaped corolla described? In the polypetalous corolla, which is the *claw*, and which the *border*?

Fig. 115.



Butterfly-shaped, Fig. 115. Papilionaceous. This corolla consists of four separate petals, each of which has a distinct name. The upper and largest is called the *banner*, or *standard*. The two side petals below or under this are called the *wings*, or *alae*, and the lowest, placed between these, and turned up like a boat, is called the *keel*, or *carina*. That part called the keel, contains the stamens and pistils, which it encloses and defends from

the weather. Ex. Pea, Bean, Sweet Pea, (*Lathyrus*,) Senna.

Prof. Lindley observes, that this tribe is not only among the most extensive that are known, but also one of the most important to man, with reference to the objects either of ornament, of utility, or of nutriment.

Fig. 116.



Cross-shaped, Fig. 116. Cruciform corolla. It consists of four petals, the borders of which stand crosswise with respect to each other. Ex. Radish, (*Raphanus*,) Cabbage, (*Brassica*.)

Plants bearing this kind of corolla are distinguished by the term *cruciferous*, or *cruciform* tribe.—Many of them possess acrid and stimulating qualities, as Mustard, Horseradish, and Cress. These plants, when decaying, emit a peculiar animal odor, which is caused by the azote, or nitrogen they contain, and which among plants is an ingredient contained in no other tribe.

NECTARY. (*Nectarium*.)

This is the organ in plants which sometimes secretes the honey, and hence is more commonly known under the name of *honey-cup*. It is not however true that every appendage known under the name of nectary secretes

In the butterfly-shaped corolla, which is the banner, which the wings, and which the keel? What is said of the importance of the papilionaceous tribe of plants? How many petals has the cruciform corolla, and how are they placed with respect to each other? What does the term nectary strictly signify? Does every part, called nectary, contain honey?

honey, nor is the honey of plants always lodged in a distinct organ. In many flowers, the nectary is not an appendage, or distinct part from the corolla, the honey being found at the base of the petals. In other plants there are projections, or appendages growing out of some part of the corolla which may or may not contain the honey. In general, therefore, every appendage, not included in the general description of a plant, is called a nectary, though often very improperly.

Fig. 117.



In the Larkspur, (*Delphinium*), and the Violet, (*Viola*), the nectary is formed by the prolongation of the corolla into a horn or spur. The Fig. 117, *a*, represents this part in the Larkspur. In the Nasturtion, (*Tropæolum*), the nectary is formed by the prolongation of the colored calyx. In the Ladies' Slipper, (*Cypripedium*), the nectary is the chief part of the flower.

Fig. 118.



In the grass of Parnassus, (*Parnassia*), Fig. 118, the nectaries consist of little globular bodies, each attached to the end of a short filament, and interspersed among the stamens. These are singular appendages, and perhaps have not been found to occur in this form in any other species.

Fig. 119.



In the Crowfoot, (*Ranunculus*), the nectary is a small pit, or pore in the claw of the petal, shown at *a*, Fig. 119.

In respect to the use of the nectary, Dr. Smith says that "There can be no doubt that the sole use of the honey, with respect to the plant, is to tempt insects, who in procuring it, fertilize the flower, by disturbing the dust of the stamens, and even carry that substance from the barren to the fertile blossoms."

Does honey exist in flowers without the presence of the part called the nectary? What is said of the nectary in the larkspur? What is said of the nectary in the grass of Parnassus, and in the crowfoot? What parts of the stamens and pistils are sometimes wanting, and what parts of each are essential?

SITUATION OF THE STAMENS AND PISTILS.

We have described and illustrated only the most ordinary form under which the stamens and pistils are found, viz: those of the Lily. These parts occur under a great variety of situations with respect to each other. Their numbers are also exceedingly various, being with respect to the stamens from one to a hundred or more, the pistils being somewhat less numerous. On the number and situation of these parts depend the scientific arrangement of the whole Linnæan System of vegetables.

We have already seen that that part of the stamen called the filament, and that part of the pistil called the style, may both be wanting. But the *anthers*, and the *stigma*, are never absent, there being no plant hitherto discovered, except some of the Cryptogamia, that is destitute of them, or of an equivalent part, either in the same flower or in separate flowers, in the same or in different plants.

In further illustrating this subject, we cannot do better than to extract from Dr. Drummond his cuts and explanations.

Fig. 120.



The stamen, Fig. 120, consists of three parts, the *filament*, the *anther*, which sits on its top, and the *pollen*, or farina, a sort of mealy powder which the anther throws out when it is ripe and bursts. Thus *a* represents the filament and anther, and *b* the pollen, falling from the latter.

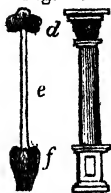
Fig. 121.



But not unfrequently in examining flowers, it will be found that the anthers are sessile, or immediately attached to the corolla. This is shown by Fig. 121, which represents a corolla laid open, the situation of the anthers being marked by the small black dots above the letter *c*.

What are the uses of the stamens and pistils to the botanist? Are the anthers and stigmas ever wanting? When the filaments are wanting, where are the anthers situated?

Fig. 122.



The pistillum, like the stamen, consists also of three parts, the germen, style and stigma. We may compare it to a pillar, and then the first will represent a pedestal, the second the shaft, and the third the capital, as in the pistil of the Lily, Fig. 122, where *f* shows the germen, *e* the style, and *d* the stigma.

Only the first and last of these, however, are essential, for if instead of a Lily a Tulip be examined, it will be found that the stigma is placed immediately on the germen.

Fig. 123.



In the Poppy, also, Fig. 123, the large globular part is the germen, on which sits the stigma, *g*, scalloped or radiated in a beautiful manner. (*Drummond's Bot. p. 208.*)

USE OF THE PISTILS AND STAMENS.

The Stamens and Pistils are the organs of re-production in all vegetables. Without the presence of these, together with the influence of the pollen on the stigma, the seeds of no plant have in any case been found to arrive to such maturity as to vegetate, or perpetuate its species. These parts have, with great labor and research, been found to exist in all vegetables, even the most minute, except perhaps in some of the cryptogamous tribes, as the Sea Weeds and Mosses, where they are not obvious.

The pollen, which to the eye appears in the form of yellow dust, and is particularly abundant in the anthers of the Lily, is in reality composed of little bags, containing a gelatinous matter. These little bags are of various forms, and when examined by a microscope, some of them present surfaces nearly smooth, and which remain entire so long as they are kept dry, but when moist they burst and throw out their contents.

The stigma, as already explained, is connected with the germen by means of the style, and is an essential part of

When the style is wanting, where is the stigma placed? What are the uses of the stamens and pistils?

the flower. The office which the stigma performs towards perfecting the fruit, is to receive the contents of the pollen, and to transmit it to the germen, or ovarium, which contains the rudiments or seeds of the new plant.

These functions appear to be performed in the following manner.

The anthers consist of many minute cells, or compartments, formed by membranous partitions. At the proper season, the anthers burst longitudinally, and the little capsules, or vessels above described, and called the pollen, are discharged in the form of yellow dust. A grain, or many grains of the pollen, falling on the stigma, there bursts, in consequence of the moisture of dew, or rain, and discharges its fluid contents. This fluid is then conveyed, by means of the absorbent vessels, or channels of the stigma, and style, to the germen, or embryo seed vessel, and thus in an unknown and mysterious manner renders the seeds fertile, or prolific. These facts were fully established, nearly a century ago, by the celebrated Linnæus, and at the present day are not denied by any competent naturalist. Indeed the experiments that have been instituted by various authors on this subject, prove beyond all controversy, that the seeds of plants are barren, and will not grow without the influence of the pollen, and that in every instance where the stigma of a flower has been shielded or protected from the pollen, infertility in the seed has been the consequence.

In all instances, the flower is formed before the fruit, though in a few cases it has appeared, even to botanists, that the fruit has been formed first, especially in the Meadow Saffron, (*Colchicum*,) and the Pine Apple, (*Bromelia*.) In the Meadow Saffron, says Sir James E. Smith, the fruit and leaves are perfected in the Spring, and the blossoms do not appear until Autumn, but a due examination will readily ascertain, that the seed bud, or germen, which is formed in the Autumn, is the very same which comes to maturity in the following Spring. A Pine Apple, adds the same writer, was once very unexpectedly cited to me as an instance of fruit being formed before the flower, because the green fruit in that instance, as in many others, is always fully grown

Under what circumstances do the anthers burst and throw out the pollen? What is said to have been the consequence when the stigma has been shielded from the pollen? Are there any instances where the fruit has been formed before the flower?

before the flowers expand. But the seeds of this plant are only in embryo, when the fruit itself is nearly full grown, and if taken out and planted, at this time, they will always prove unproductive.

In those genera of plants which bear their stamens on one tree, and their pistils on another, the same law of nature has been verified in numerous instances. The pollen of one tree must come into contact with the stigma of the other, in order that the seeds may come to maturity. The most decisive proof of this was established by an experiment, so long ago as 1749, made on a Palm tree at Berlin. The Date Palm, like the Fig, Willow, and Poplar, has its stamens and pistils on separate trees, and it so happened that the Palm, at Berlin, was the only tree of that species in the vicinity. It had therefore never perfected any fruit, though every year full of flowers which contained the pistils. In the year above mentioned, when the tree was in full bloom, the branch of a staminate tree was sent from Leipsic, by the Post, to Berlin, a distance of twenty German miles, and suspended over the barren Palm. The consequence was, that the tree produced an abundance of fruit that year, which came to full perfection, and many young palms were raised from the seed.—*Ed. Ency.*

In trees of this class, which are called *Diœcious*, the pollen is wafted from the stamens of one to the pistils of the other, by the wind, or is carried by insects, which fly from one tree to the other, in search of honey. As plants of the same species commonly grow in the vicinity of each other, there is no difficulty in conceiving that the prolific influence may be transmitted in this manner.

The genera which bear their stamens and pistils on the same plant, but in different flowers, are called *Monœcious*. In these plants the pollen is also transmitted through the air, or by means of insects. Indian Corn is a plant of this kind, the stamens being situated in the panicle, or top, while the pistils are enclosed in the husk, forming long filaments, usually called the *silk*. Cucumbers, Pumpkins, and Gourds, are also *Monœcious* plants.

In various instances we can trace highly curious and interesting means employed by nature, to apply the pollen

What was established by the experiment made on the Palm tree of Berlin? How is the pollen conveyed from one tree to another, where the stamens and pistils are on different trees? In what common garden vegetables are the stamens in one flower, and the pistils in another?

to the stigma, where the situation of those parts is apparently unfavorable to this process. When the stamens are shorter than the pistils, the flower often, or perhaps commonly droops, so that when the anthers burst, the pollen will fall on the stigma. And it has been remarked as worthy of notice, that in drooping flowers, the stamens are always shorter than the pistils, while in erect ones the pistils are always the shortest. This provision is evidently designed to favor the contact of the pollen. In the *Parnassia*, the stamens which are longer than the pistil, lean over the stigma in succession, and shed their pollen. In the common Laurel, (*Kalmia latifolia*,) we have often observed with admiration, the means employed to accomplish the same end. The ten anthers of this species are confined in as many pits in its wheel-form corolla, until the proper time for the influence of the pollen, when by the shrinking of the flower they are liberated from their confinement, and instantly spring with such force as to throw the pollen, in a little stream of dust, far above the stigma. The slightest touch with the point of a needle, or even the feet of insects, crawling over these parts, will produce the same effect, at the proper season.

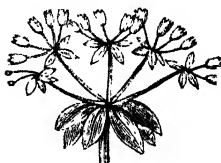
INFLORESCENCE.

• Inflorescence signifies the manner or mode of flowering, or as Prof. Lindley has it, “the ramification of that part of the plant intended for re-production.”

The modes of flowering are various, and are distinguished by different names, which have been derived from something relative to the appearance, situation, or number of the flowers.

The kinds which botanists more particularly distinguish, are as follow.

Fig. 124.



1. Umbel, Fig. 124, (*Umbella*.) This is that kind of inflorescence that is produced when several peduncles, or flower stems, proceed from a common centre, in a whorl, like the branches of an umbrella inverted, and reaching the same height, form nearly a level head of flowers. Ex.

Carrot, Dill, Fennel. These plants are called *Umbellifer*-

What is meant by inflorescence? What is the form of an umbel? What are examples of this kind of inflorescence?

ous, and form one of the best characterized among the natural order of plants. Most umbels are formed by compound plants, each stem or ray, bearing itself a partial, or little umbel, as represented in the figure.

Fig. 125



2. Verticillate, Fig. 125, (whorled.) When the flowers on very short petioles, or sessile, form a ring at intervals around the stem. In some species, however, the flowers are not continued all round the stem, but only on opposite sides, as in Dead Nettle, (*Lamium*.) Many of the labiate flowers are whorled, as Mint, Motherwort, and Hyssop.

Fig. 126



3. Racemus, Fig. 126, (a cluster,) or Raceme. This consists of numerous scattered flowers, each on its own proper stem, the whole proceeding from a common stalk. It is generally pendulous. Ex. Grape, Currant, Poke weed, (*Phytolacca*.) A cluster is sometimes compound, that is, consisting of several smaller clusters, each having its own proper stem, all of which proceed from a common stalk. The Raceme often runs into the Spike at the top; as does the Panicle into the Raceme.



4. Spike, Fig. 127, (*Spica*.) This is composed of many sessile flowers, arranged on a common peduncle. It generally grows erect, with crowded flowers. In some spikes, however, the flowers form separate groups, leaving intervals of the stalk naked, as in some of the Mint tribe. Ex. Wheat, Barley, Virginian Speedwell, (*Veronica Virginica*.)

What is the form of that kind of inflorescence called a whorl? What is the form of a raceme? What are examples? What is the form of a spike, and what are examples?

Fig. 128.



5. Panicle, Fig. 128. A panicle bears its flowers in a loose, irregularly divided raceme, or cluster, but differs from it in the sub-divisions of its foot-stalks. It sometimes consists of several small spikes, fixed by separate peduncles to a common stem. When the stalks are distant, it is called a *diffuse*, or *lax* panicle, as in London Pride, (*Saxifraga umbrosa*.) The Oat, and many grasses, are examples of the panicle.

Thyrus. A panicle, the middle branches of which are longer than those of the base or apex, in consequence of which it assumes an ovate form, is called a *thyrus*. The flower of the Lilac, (*Syringa vulgaris*.) is a good example.

129. Spadix, Fig. 129. A spadix differs from a spike, in the flowers of the former being crowded, or packed close together on a succulent stem, or elongated receptacle, which stem is partly enveloped in a spathe, or sheath. The dark colored, club-shaped part of the figure, marked *a*, is the spadix of the Indian Turnip, (*Arum triphyllum*.) partly enclosed in its spathe, or sheath. In a few instances, as in the Golden Club, (*Orontium*.) the spadix is naked, or without a spathe. Dr. Drummond, from whom this "cut is taken, remarks, that this plant has a resemblance to an image standing in a case, and hence in Ireland has received the ridiculous name of "Jack in a box," and "Jack in a pulpit." The Skunk Cabbage, (*Pothos fatida*.) and the Indian Turnip, (*Arum*.) are also good examples of the spathe.

Fig. 130.



Corymbus, Fig. 130, a corymb. This is a raceme, in which the lower flower stalks are long, and the upper ones short, so that the flowers are nearly on a level. In general appearance it resembles the umbel, but in the latter the foot stalks surround the stem at the same height, and are all nearly of the same length. Yarrow, (*Achillea*.) and Spear-leaved Golden Rod, (*Solidago lanceolata*.) are common examples.

• What is the shape of a panicle, and what are examples? What is the form of a thyrus? What common flower is an example of the thyrus? How does a spadix differ from a spike? Which is the spathe and which the spadix, as shown by the figure? What is the form of a corymb?

Fig. 131.



Capitum, Fig. 131, head. This consists of sessile flowers, crowded together into a globular form. Ex. Teasel, (*Dipsacus*,) Clover, (*Trifolium*,) Saffron, (*Crocus*,)

Fasciculus, a tuft, or bundle. When the peduncles of the corymb are placed so near each other, that the flowers form a dense mass, as in the Sweet William, (*Dianthus*,) the inflorescence is called a fascicle, or bundle.

Terminal. When the stems, or branches, are not elongated beyond their flower, or, in other words, when the flower terminates the ends of the branches, the flower is said to be *terminal*. Ex. Peony, Pink.

In consequence of the different modes of inflorescence running into each other, it is often necessary to employ the terms by which each is known in a compound sense. Thus some *Spikes* so resemble the panicle as to become panicked spikes, and the umbel and corymb, run into each other, forming corymbed umbels.

FRUIT OR SEED.

The *fruit* or *seed*, is the most important part of vegetables, not only because it affords sustenance to man, but because by this part the species are perpetuated, or renewed without limits. "The fructification," says Linnæus, "is a temporary part of vegetables, destined for the re-production of the species, terminating in the old individual, and beginning the new."

In ordinary language we make a difference between the fruit and the seed. In the language of Botany, this difference also occurs, but in a more restricted sense. When the seed is inclosed, the envelope and seed together, are called the fruit, as in the Apple, Pea, and Walnut. When the

What is the difference between the corymb and the umbel? What is the form of a capitum, or head? When is the inflorescence called a fascicle or bundle? When is the flower said to be terminal? What are the different kinds of inflorescence described? What is said of the importance of the seed, or fruit? In the language of Botany, what part is called the fruit?

seed is naked, then this alone is called fruit, as in the Hazelnut, (*Corylus*,) and Sage, (*Salvia*.) Strictly speaking, however, no seed ever does occur naked, since each one though inclosed in a shell, husk, or pod, has its own membrane, or *integument*, which surrounds the proper seed. Thus when a Pea, or Bean, is planted, and the two halves called *cotyledons*, swell, this membrane, or sack, bursts, and is cast off. When therefore a seed is said to be naked, it is only understood that it is not inclosed in any covering except its own proper membrane.

The fruit, in the proper sense of the word, is the pistillum arrived at maturity. But this term is also applied to the pistillum, and floral envelopes taken together, when they are all united in one uniform mass.—*Lindley*. We shall consider the fruit as consisting of the matured germen, including the coverings, or envelopes of the seed, called the *pericarp*, and shall at present, omit the terms employed by Prof. Lindley, Mirbel, and other scientific writers, in explaining the more physiological parts of this subject.

PERICARP.

• This term is derived from the Greek, *peri*, about, or around, and *karpōs*, the seed, or fruit. It therefore is a general term, including any seed-vessel, or substance enclosing the seed, whether it be in the form of *pod*, *bag*, *shell*, *pulp*, or *berry*.

The most obvious use of the pericarp is to protect the seeds until they are ripe. It may be observed also, that many seed vessels promote the dispersion of their seeds, thus performing one of the great designs of nature, that of spreading her productions. The common garden flower, Touch-me-not, (*Impatiens*,) is a familiar example of such a provision. The pericarp, which is composed of several valves, as it grows dry, acts as an elastic spring, and throws the seeds to a considerable distance in all directions. The pericarps, according to the Linnæan division, are of the following kinds, viz.

• Are the seeds of any plants found naked, strictly speaking? When are seeds said to be naked? What is the pericarp? What is the most obvious use of the pericarp? How do some pericarps promote the dispersion of their seeds?

Fig. 132.



Capsule, Fig. 132. This term signifies a little chest, or casket, and in Botany, is applied to that kind of seed vessel which is of a woody texture, and which, as it grows

dry, discharges its seeds spontaneously, by dividing into several parts called valves. In some plants the capsule discharges its seeds by pores, or small orifices, the valves remaining closed, as in the Poppy, (*Papaver*.)

The capsule consists of one cell or of many. The above figure, (from Drummond,) represents capsules of one, two, three, and four cells. The first is called a *one celled*, the second a *two celled* capsule, and so on, according to the number of divisions, or compartments it contains. The membrane, or other substance which forms these divisions, is called the *dissepiment*, or partition, and the central part where these partitions meet each other, and to which the seeds are usually attached, is called the *columella*, or pillar of the capsule. Sometimes this is merely a thread. The pericarps of Flax, (*Linum*,) of Mullein, (*Verbascum*,) and Thorn-apple, (*Datura*,) are capsules.

Fig. 133.



Silique, a pod, Fig. 133. This is a pericarp of two valves, or in the language of Botany, a *bi-valved* pericarp. The seam formed by the joining of the two valves of any pod, is called the *suture*. In some pods the seeds are all affixed to one suture, generally the upper one, and in others they are arranged alternately along the edges of a membrane or partition, which separates the pod into two portions, in the line of the sutures.

The silique, properly so called, is of the latter description, as represented by the figure, where by a separation of the valves, this partition is seen, with the seeds attached. The pericarps of Cabbage, Turnip, and Wall-Flower, are of this kind.

What kind of a pericarp is the capsule? What examples are given where the seeds are discharged by orifices? What is a seed vessel called, a one or two celled capsule? What is the dissepiment, and what the columella? What is the suture of a pod? What pericarps are common examples of the silique?

Fig. 134.



Silicle, Fig. 134, or *Silicula*, a little pod. This differs from the proper *siliqua*, only in being shorter, and of a rotund or oval shape, as in *Satin Flower*, (*Lunaria*.) *Shepherd's Purse*, (*Thlaspi*.) is also a good example of the *Silicle*.

Fig. 135.



Legume, Fig. 135, *Legumen*. This is a species of pericarp, consisting of two valves, united by sutures, without a dissepiment or partition, and bearing the seeds along only one of its sutures, or margins. This is also called a *pod*, and is well known as the seed vessel of the *Pea* and *Bean*. Peas and Beans, with their affinities, or plants of similar habits, are called *leguminous* plants. They compose one of the most extensive tribes, or natural orders known to Botanists, and one of the most useful known to man. The 17th class, (*Diadelphia*.) of the Linnæan system, is composed chiefly of leguminous plants.

Fig. 136.



Bag, Fig. 136, *Follicle*. This is a seed vessel consisting of only one piece or valve, and is therefore a *univalve pericarp*. It is not divided into cells internally, but bears its seeds, either on a receptacle which is placed parallel with the suture, or the seeds are affixed to the margin of the suture itself. This pericarp bursts longitudinally on one side, and emits its seeds in the manner shown in the figure. Ex. *Milkweed*, (*Asclepias*.) *Periwinkle*, (*Vinca*.)

Fig. 137



Drupe, or *Drupa*, Fig. 137, *Stone Fruit*. It has a fleshy, or pulpy pericarp, without valves, and which encloses a nut, or stone, commonly of an oblong, or oval shape, and bony consistence. This stone contains a kernel, which is the proper seed. Ex. *Cherry*, *Plumb*, *Peach*. The *Coccolnut* is a drupe, though its coat is less juicy than in most other examples.

What is a silicle? How does the silicle differ from the siliqua? How does the legume differ from the siliqua and silicle? What are common examples of the legume? What are examples of leguminous plants? What is a follicle or bag? What are examples of the follicle? What are examples of the drupe?

The *Nut* is a dry bony fruit, commonly with only one cell, but sometimes with more. It differs from the drupe, in wanting the fleshy pericarp. Its external envelope is sometimes hard, and valvular, as in the Walnut or Hickory, and sometimes membranous, as in the Hazlenut, (*Corylus*.) In others the covering is only partial, as in the Acorn.

Fig. 138. *Bacca*, Fig. 138, a Berry. The Berry is a



succulent fruit, in which the seeds lose their adhesion, when ripe, and lie loose in the pulp. The Berry becomes more juicy internally, as it advances to maturity, quite contrary to the nature of the capsule, though the difference between these two unripe fruits may not be discernible, and though some true Berries, when fully ripe, finally become of a dry and spongy texture, but they (the Berry) never open by valves, or any regular orifice, like the capsule.—*Smith*.
Ex. Currant, Gooseberry.

Cut an Orange, or Lemon in two, and you will find its seeds, neither in a *stone*, like the Cherry, nor in a *capsule*, as in the Apple, but lying naked in the pulp. The Orange, and Lemon, therefore, are berries.—*Drummond*.

Fig. 139.



The *Strawberry*, Fig. 139, is not a berry, but a soft, red, pulpy receptacle, which bears the seeds on its outside, and which appear like small yellowish dots.

Fig. 140.



Compound Berry, Fig. 140. This consists of many small berries, each containing a seed, united into one mass. The Blackberry, and Raspberry, are common examples of the compound berry. Each protuberance, or individual part, is denominated an *acinus*, or grain; and contains within it a single seed.

Fig. 141.



Apple, Fig. 141, Pome. or Pomum. This is a fleshy pericarp, without valves, and therefore, in this respect resembles the berry or drupe. But it differs from both these, in containing a capsule which encloses the seeds. The Apple, Quince, and Pear, are common examples. The number of seeds contained in pericarps of this

How does the nut differ from the drupe? What is the definition of a bacca, or berry? What are common examples of a berry? What is the strawberry in the language of Botany? What is a compound berry? What are examples of the compound berry? How does the apple, or pome, differ from the berry, and drupe?

kind, as well as the shape, size and quality of the fruit, are exceedingly various. Some berries so nearly resemble the apple kind, that it is difficult to draw the line of distinction between them.

Fig. 142.



Strobulus, Fig. 142, a Cone. The cone may be considered an indurated, or hardened amentum, which being persistent, finally becomes the capsule, or seed vessel, as in the Pine, Cypress, and Fir. The seeds in these tribes, after being perfected, are closely sheltered by the scales which lie over each other, like the shingles of a house.

In the catkins of the Birch and Alder, there is a kind of capsule, in addition to that contained in the cones of the Pine, and in the Willow and Poplar there is a bivalve capsule, suspended by a stem, quite distinct from the scales.

SEED.

The seed consists of *integuments*, (coverings,) *albumen*, and *embryo*, and is the result of the reciprocal action of the stamina and pistils.—*Lindley*.

The integuments are the coverings immediately external to the embryo, or germen, being that part of the seed which contains the rudiments of the future plant. When a Bean or Pea is exposed to heat and moisture, or when it is *planted* in the ground, the embryo swells and the integuments burst. In these seeds it is called the *skin*; in Indian Corn it is called the *hull*. This appears like a continuous, or single substance, but it really consists of three parts, or layers, into which it may be divided by careful treatment. In some seeds, the outer integument is covered with down, or hair.

The *Albumen*, or white, is the farinaceous, fleshy, or horny substance, which composes the chief bulk of some seeds, as Wheat, Corn, and the Grasses. This substance furnishes wholesome nourishment, even when other parts of the plant are poisonous. It is destined to nourish the young plant when it first begins to spring from the parent seed, and before it sends roots into the earth, and therefore does not rise out of the ground. Care must be taken not to con-

- What is the strobulus, or cone? How are the seeds protected in the cone? What are the parts belonging to the seed? What are the integuments of the seed? Is the skin of a bean composed of one, or several coats? What is the albumen of the seed?

found the white, fleshy part of leguminous seeds, as Beans, with the albumen of the grains, and grasses, as these parts which are called *cotyledons*, generally rise out of the ground, and sometimes become the first leaves of the new plant. It is probable, however, that these seeds contain a portion of albumen; but this substance abounds chiefly in plants having but one cotyledon. In some seeds the albumen is said to be entirely wanting, as in those of the Gourd, Cucumber, and Turnip.

Fig. 143



The *Embryo*, Fig. 143. The embryo, strictly speaking, consists of the *cotyledons*, the *radicle*, and the *plumula*, though it is often defined to include only the two last named parts. The number of cotyledons, in most seeds, is two, but in the grasses, and grains, there is only one, and in a few seeds, as those of the Pine, there are many. In the Garden Bean, which is usually chosen as an illustration of these parts, the two cotyledons are well known under the name of the seed-lobes, being the two halves of the seeds which rise above the ground, and are converted into the two seed leaves of the young plant. The above figure is intended to represent these parts, separated by the act of vegetation, or by the swelling of the *radicle* and *plumula*.

The *plumula* and *radicle* are the rudiments of the future plant. The radicle *c* is the descending part, and ultimately forms the root. The plumula *a* is the ascending part of the plant, and is finally developed into the stem, on which the leaves and fruit are formed.

The plumula and radicle are the most essential parts of all seeds, and to the perfection of these parts all the others are subservient. If, when the seed is perfected, and fully ripe, these parts are in any way injured, the design of nature in forming the seed, and protecting it with so much care, is entirely frustrated, since it will not produce the future plant.

Plants having but one cotyledon are called *monocotyledonous*, as the grains and grasses. Those having two cotyledons, are called *dicotyledonous*, as the Bean and Pea.

In what plants does the albumen chiefly abound? In what seeds is the albumen said to be entirely wanting? What are the parts of the embryo? What is the number of cotyledons in most seeds? In what plants do they differ from this number? What part of the bean are the cotyledons? What part of the young plant is the radicle? What part of the young plant is the plumula?

Hilum, the scar. This is that part which is commonly termed the eye of the seed, and indicates the place of union between it and the seed vessel, or pericarp. Through this connection, it is, that the seed receives its nourishment during its growth. When the seed is ripe, this organ of communication becomes dry, and separates from the parent plant without injury. When the seed is planted, it is supposed to imbibe moisture from the earth through the pores of the hilum, and on this circumstance its germination, or growth, seems to depend.

Fig. 144. *Pappus*, Fig. 144, egret or seed-down. *Pappus*, in Latin, signifies grandfather, or old man, the term being originally applied to the seed-down of the Thistle, on account of its resemblance to the grey hairs of old age.



The pappus is commonly found attached to such seeds as want the pericarpium, as the compound flowers. The Thistle, Dandelion, and Colt's Foot) are examples. It is either *sessile*, that is, placed immediately on the seed, or furnished with a stipe, by which it is elevated above the seed.

The above figure represents the pappus of the Dandelion, with its stipe; *c*, the down; *a*, the stipe, and *b*, the seed.

Fig. 145.



The *Sessile* pappus, Fig. 145, consists of the down and seed only, the stipe being wanting.— Of this the Thistle, (*Carduus*.) is an example.

Fig. 146.



Plumose seed-down, Fig. 146. The appendage to the seed is so called, when the filaments, or downy threads, being of considerable length, rise directly from the seed, and are furnished with softer filaments on each side, like a feather. Sometimes this plumose appendage is formed by the elongation of the style of the plant, as in the Virgin's Bower, (*Clematis*.) When it is thus formed it is called *cauda*, a tail.

What is the hilum, or scar? What is the pappus? To what tribes of plants is the pappus peculiar? What is the form of the plumose seed down? What is the ala, or wing of a seed?

Ala, a wing. This is a dilated, membranous appendage, with which some seeds are furnished, and which is undoubtedly designed to waft them through the air. Capsules are sometimes furnished with similar appendages, as in the Maple, (*Acer*,) and Ash, (*Fraxinus*.)

BUDS.

Buds or Gems are of three kinds, *leaf* buds, and *flower* buds, and those enclosing both.

The leaf buds consist of rudimentary leaves in the form of scales surrounding a vital, or living point, which is capable of elongation upwards and of forming a stem by the growth of the plant.

The flower buds consist of scales surrounding a point, containing the rudiments of the flower, or the re-productive organs of the plant.

The buds of trees are not formed in the spring, or just before they are developed into leaves and flowers, but in the summer, or autumn buds are destined to preserve the rudiments they contain, from the wet and cold of winter.

That the use of buds in the economy of vegetation is for the protection of the vital portion of the plant, is clearly proved by the fact that there are no buds in hot climates, or in hot houses, where the temperature of summer is constantly maintained. This circumstance is as wonderful as it is curious and interesting to the naturalist, since it shows that plants are endowed with a sort of conservative power by which new parts are produced as they are wanted. In hot climates bud scales are not wanted, the rudiments of the flower requiring no protection, and the same is the case with summer or annual plants growing in our climate. In both instances the outer coverings, or winter cases are entirely wanting. Whereas in all instances in which the embryo requires protection from the frost of winter, cases or scales are furnished accordingly. In Siberia, it is said, there are few, if any plants without buds.

Buds have various forms, but are most commonly oval or roundish, often having a sharp point as in the Apple.

What are the two kinds of buds? What do the leaf buds consist of? What do the flower buds consist of? What is the use of buds? How is it proved that buds are produced for the protection of the embryo branch and flower? What is said with respect to the buds of Siberian plants? What are the forms of buds?

Peach, and Pear. Sometimes the bud is shaped like a cone or is even extended to the form of a stilette, as in the Beach.

In the central part is the embryo, whether of the leaf or flower. •

With respect to the arrangement, or manner in which the leaves are folded within their buds, there is a curious and inexplicable difference in different plants, or groups of plants. Some are doubled, others are rolled, while others are plaited, &c. The following figures from Mr. Rennie's pretty little book, called the "Alphabet of Botany," will show how leaves are folded in their buds.

Fig. 147.



a Doubled, *a*, as in the Oak, and Rose.



b Doubled and embracing each other, *b*, Valerian and Teazel.



c Doubled, in a compound manner, *c*, as in Carrot and Mimosa.



d Rolled inwards, *d*, as in the Grasses.



e Tiled, *e*, as in Lilac and Privet.

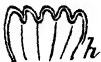
Fig. 148.



f Reclining, *f*, as in Wolf'sbane, and Anemone.



g Rolled breadth-wise, *g*, as in the Ferns.



h Plaited, *h*, as in the Palms and Birch.



i Rolled outwards, *i*, as in Rosemary and Primrose. •

What is said with respect to the manner in which leaf buds are folded?

In all cases, whether the leaves be rolled, folded, or plaited, they are so arranged as to occupy the least possible space.

There is a distinction in the forms of the leaf and flower buds, by which each may be known, the leaf bud being always more slender and pointed than that producing flowers. Hence, gardeners and others, by inspecting the buds of fruit trees, can decide in the Spring, on the prospect of a fruitful season.

The flower gems like those of the leaves are wrapped up in various forms, the petals and calyx being sometimes rolled into spirals, sometimes plaited, or doubled, &c.

Du Hamel has given some very curious details with respect to the bud of the Horse-chesnut, a tree in which this part is peculiarly conspicuous in the fall and early spring. The figures represent three stages in the growth of this bud.

Fig. 149.



The bud, *a*, Fig. 149, is represented in its entire state, covered with its winter case, or scales, and terminating a branch.

Fig. 150.



The same is shown at *b*, Fig. 150, examined in the spring, and exhibiting its young leaves, just beginning to expand, but still enclosed by the bud scales, by which it has been protected during the winter.

Fig. 151.

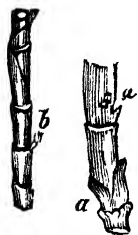


The same, *c*, Fig. 151, with the young leaves partly opened, the bud scales being removed.—The pith of the branch in the autumn was found to terminate completely at the base of the bud as represented in *b*, and in the spring following, although the pith of the new shoot came in contact with the old, yet it evidently was not a continuation of it, but a new production of the gem. The

What is the distinction between the leaf and flower buds? Is the pith of the new bud a continuation of the old or not?

same fact is apparent in the buds of the Cherry, Peach, Lilac, and perhaps all other plants.

Fig. 152.



The buds of grasses and grains are distinguished by an outer single scale, between the stem and the bud, while plants of other classes, or tribes have two scales on opposite sides of their buds, either distinct or united.

The cuts represent this arrangement, *a*, *a*, being grass buds covered with their scales, *b*, shewing the naked buds, the scales being removed.

The buds which enclose both leaves and flowers are also distinguished by their forms, but the difference is not so considerable as those which contain only the one, or the other, this shape being a medium between the others.

In conformity to these different contents, buds have been arranged into three species, namely,—

1. *Gemma foliifera*, or leaf gems.
2. *Gemma florifera*, or flower gems.
3. *Gemma mixta*, or mixed gems.

Buds though connected with the parent stalk and produced by the vital action of the plant of which they are the progeny, are still, in themselves complete individuals.

We have seen above that the pith of the new bud is not a continuation of the old, but a new production. That there is no necessary connection between the tree and bud after the latter is formed, is proved by the fact that if a bud be cut from one tree and inserted into another, it will grow into a perfect branch, and bear fruit in the same manner that it would have done on the parent tree. How far with respect to classes and orders this may be carried into practice, we know not. It is certain however that in some instances plants of very different characters will grow on each other, as in the well-known instance of the Quince on the Thorn-bush. Plants of the same natural orders we believe may be budded successfully to almost any extent.

What peculiarity is there in the buds of the grasses? How have buds been arranged into species? Are buds complete individuals, or parts of the parent?

Thus the Potato has been made to grow on the Love-apple, (*Tomato*), and the Melon on the Gourd.

The budding of fine varieties of fruit on inferior trees of the same kind, and the more beautiful varieties of flowers on stalks that are less so, is practised very extensively by horticulturists. Thus the fine varieties of the *Dahlia* grow on the common sorts, by inserting their young buds or eyes into the root.

DISTRIBUTION OF SEEDS.

The Great Author of nature has undoubtedly performed all his works in a manner far more perfect than the mind of a finite being can possibly comprehend. This may be inferred, not only from the wisdom of the Maker, but also from the universal truth, that the more intimately we become acquainted with the minute parts, or hidden principles of nature, the greater cause do we find for our admiration and astonishment. Still, in no instance is it probable, that we are fully sensible of the mechanical perfection of any organic structure, or that we shall ever, in this world, become fully acquainted with the laws by which the actions, or functions of such structures are governed. A plant, as well as an animal, is surely "a collection of wonders." The roots, the stems, the branches, the leaves, the flowers, and the seeds, are not only perfect in themselves, but are perfectly adapted, by their varieties, to the places where they grow, and the purposes they are intended to answer in the scale of creation. If we examine each of these parts with attention, and especially if this is done by means of microscopic glasses, we shall be astonished at the regularity and beauty with which the minutest parts of each are constructed. In these cases, however, our knowledge is "but in part," for although this precise structure indicates design, yet there is nothing in the structure itself which explains to us the purpose it is intended to answer. The indications of nature with respect to the construction of many external parts of plants, are, on the contrary, such as we can clearly understand, because their forms, or actions, are such as to make their uses perfectly obvious. This is the case with respect to the contrivances with which

many plants are furnished for the purpose of distributing their seeds, and which are often highly interesting, as displaying the wisdom and design of Providence in the lower orders of creation.

In several species of plants, the pericarps, as they become dry, open with a jerk, and thus throw the seeds they contain, several feet, or even yards, in all directions. The common garden flower, Touch-me-not, (*Impatiens*.) is an example. In some of the Ferns, (an order of plants which bear their seeds on the backs of their leaves, or fronds,) a similar provision may be observed. On examining a plant of this tribe, small spots will be seen on the back of the frond, sometimes at small distances from each other, and sometimes closely crowded together. These are the organs of re-production, and are called *sori*. The seeds are furnished with elastic springs, by which, when fully ripe, they are thrown to the distance of a foot or more. These seeds are exceedingly minute, but on placing a frond on a sheet of white paper, the effect may be observed by their distribution over its surface.

The little pods of the Furze, (*Ulex*.) with the same design, are made to burst with an explosion, when the seeds are fully ripe. In dry, still weather, the snapping or explosion thus produced may be heard to a considerable distance.

Many seeds, as already stated, are furnished with a pappus, or egret. Among these, the Dandelion, the Thistle, and the Colt's Foot are the most common examples. This appendage constitutes the *wings* of such seeds; and who, after having seen the air filled with the germs of these species, thus taking their flight from one place to another, can for an instant doubt that this downy apparatus was given them with the express design of their thus fulfilling two of the great ends of nature, the perpetuity and distribution of the species. These often continue their migrations, says Dr. Smith, "till they are overtaken by a shower, which, moistening their wings, stops their further flight, and at the same time, accomplishes its final purpose, by immediately promoting the germination of each seed in the moist earth."

. . In what manner may the spontaneous distribution of fern seeds be observed? In what manner do the pods of the furze distribute its seeds? What is the use of the pappus, or down, with which many seeds are furnished?

The seed of the Maple and Ash are also furnished with wings, not of down, but consisting of a fine membrane, and by means of which, they are transported from one place to another at the distance of several miles. Other seeds are provided with hooks, or barbs, by which they attach themselves to the clothing of various animals, and are thus carried away from the places of their growth. There are few persons on whose acquaintance the seeds of the Burdock, (*Arctium lappa*,) have not forced themselves by such means. The calyx of this plant is furnished with hooks, standing in all directions, and which, therefore, are always ready to catch hold of any fibrous substance that happens to touch it. The tenacity with which these little intruders keep their hold, is well known to those who have been the subjects of their attack.

There are many other plants whose seeds are provided with similar means of disseminating themselves to various distances. The fruit of the little vine, with whorled leaves, called Cleavers, (*Galium*,) is in the form of a burr, which attaches itself to almost every thing that comes in its way, and hence there is hardly a place in the woods, or along fences in the fields, where it is not to be found. The Tick-seed, (*Ancistrum*,) and the Sea-Burdock, (*Xanthium*,) are possessed of similar appendages, by which their seeds cling to other substances, and are thus carried away from the places of their growth. The awns, or beards, of many of the grasses, answer the same purpose. For such seeds as are not furnished with wings, or hooks, the wisdom of the Creator has provided other means to effect their dissemination. Animals, such as squirrels and birds, are the instruments by which the seeds of nuts, and the kernels of pulpy fruits, are often transported to considerable distances from their places of growth. Birds, in consequence of the rapidity of their flight, often carry seeds some hundreds of miles from the places of their growth. This circumstance will frequently account for the appearance of a single plant in situations where its species are entirely unknown, and where not another individual of the same kind is to be found in the same district of country. Every practical

What is said of the wings of the maple and ash? By what means are the seeds of the burdock distributed? What other seeds are mentioned as being provided with similar means of dissemination? What is said of the transportation of seeds by animals and birds?

botanist will remember instances where the appearance of a species is in no other way to be accounted for.

Transportation by the currents of oceans, seas, and rivers, is still another means of dispersing the seeds of plants. This, it is true, would appear to us as a matter of entire accident, but still there is no doubt that it was designed as one of the means of performing this great end. The benefits of this mode of transporting seeds, have indeed to mankind, probably been greater than any other natural means. Thus we find that certain kinds of tropical fruits, which are of the utmost importance as articles of food to the inhabitants of many tropical islands, are common to such islands, though situated several hundred miles apart, or at such distances as to afford no probability that their original inhabitants ever communicated with each other. In these cases there is no doubt but the seeds of these plants were carried from the main land, or from one island to another, by the currents of the ocean. By the same means, the fruits of America and of the West-Indies are cast upon the shores of the northern coasts of Scotland, the plants of Germany migrate to Sweden, and those of southern Europe to England.

The currents of rivers are a still more certain means of producing similar effects, because, being of fresh water, more vegetables grow on their banks, than on the shores of the ocean. Rivers, also, being subject to overflow their banks, there are more frequent opportunities for seeds to take root, and during high freshets, a greater probability that a variety of seeds would be thus carried away. In this manner, plants growing at the highest sources of the great rivers of North-America, may not only be transferred to their banks in more temperate climates, but having reached the ocean, may continue their migrations to foreign continents. Thus seeds from the head waters of the Mississippi, may be carried to Africa, or Asia, distances equal to the earth's diameter.

All these circumstances tend to show, that what we call *nature*, every where exhibits care and design, and that the

What is said of the transportation of seeds by the currents of the ocean? What is said concerning the dissemination of seeds by the currents of rivers? What is it said that all these circumstances tend to show?

lowest, as well as the highest orders of creation, are equally and constantly under the superintendence of an Almighty agent.

RECEPTACLE.

The receptacle, is the dilated apex, or extremity of the flower-stalk, or the point of connexion between the peduncle and the flower. In most plants it is not distinguished by any particular figure. But in the compound flowers, which chiefly constitute the class Syngenesia, and in describing which this term is mostly employed, the receptacle is a remarkable and highly important part. When the downy seeds of the Dandelion and Thistle have taken their flight, the button-shaped, naked and expanded part which remains on the extremity of the stalk, is the receptacle.

F. 153. Fig. 153, *a*, represents this part in such a state, most of the seeds having disappeared, the points, or dots on its surface show the places of their attachment.



The term receptacle, is also employed to designate that thread-like part of the ament to which the florets are attached. On stripping the chaffy scales from the ament of the willow, or chestnut, the filament which remains is the receptacle.—

Under the name of *columella*, or pillar, this term also signifies that part of any fruit to which the seeds are attached. The cob of an ear of Indian corn is a *columella*.

COMPOUND FLOWER.

A compound flower consists of many small flowers, or florets, (each having its stamens and pistils,) all situated on the same common receptacle. The Daisy, Sun-flower and Dandelion, are familiar examples. In the flowers of this class, the anthers of the florets, or each individual little flower, are united into a cylinder. The chief exceptions to this, exist in the genus *Tussilago*, or Colt's-foot, and the

What is the receptacle of a flower? In what tribe of plants is the receptacle most important? What part of an ament is called the receptacle? What is a compound flower? What plants are familiar examples of the compound flower?

genus *Kuhnia*. The florets in compound flowers, with an exception or two, have each five stamens. They are also monopetalous, and superior, each one standing on a single naked seed.

The central portion of a compound flower is called its *disk*, while the portion which surrounds this is called its *radius*, or ray. In the Daisy, the disk is yellow, the ray being white. It is a curious fact, that though these parts are often differently colored, still there are only certain colors under which they ever appear. Thus the disk is most frequently yellow, while the rays may be yellow also, or white, red, or blue. But no instance has ever been known in which the flower had yellow rays, with a white, red, or blue disk.

AGGREGATE FLOWERS.

Flowers are called aggregate, when several florets are situated on the same receptacle, each floret having its anthers distinct and separate, and not united into a cylinder, as in the compound florets. Dr. Smith observes that flowers of this kind are seldom yellow, but are most commonly either blue, purple or white. The Teasel, (*Dipsacus*.) and the Cat's-eye, (*Scabiosa*.) are examples.

We have now described and illustrated all parts of a plant, from the root to the seed, and have defined such botanical terms as are most necessary for the young botanist to understand, and be able to apply, when he goes into the field to collect and distinguish flowers.

We have not, in the usual manner, given a list of terms belonging to each subject, before such terms had been illustrated and explained, because the student can gain a proper knowledge of scientific words, only by understanding how they are applied. It is therefore worse than useless for him to burthen his memory with a list of terms in advance, since he would thus be in danger of confounding them. But as terms of science belonging to the same subject, often have a mutual relation to each other, the pupil, after having learned their uses individually, will be enabled much better to understand and remember the application of each, by having them thrown together.

What is the central portion of a compound flower called? What is said of the colors of the disk and rays? What are aggregate flowers?

We shall therefore, here give a synopsis, or comprehensive view of what is contained in the foregoing pages, and which the pupil will find it to his advantage to understand, and be able to enunciate clearly, before he proceeds with what follows.

RECAPITULATION.

ROOT.

The root is the descending part of the vegetable, or that part which enters the earth in search of nourishment.

In respect to duration, roots are as follows:

1. *Annual*, as the Potato.
2. *Biennial*, as the Beet, Parsnip, and Carrot.
3. *Perennial*, as the Oak, Chestnut, and Birch.

In respect to form, roots are

1. *Fusiform*, or spindle-shaped. Ex. Carrot.
2. *Premorse*, or bitten off. Ex. Wild Turnip.
3. *Ramose*, or branched. Ex. Most Trees.
4. *Fibrous*. Ex. The Grasses.
5. *Knotted*, or tuberous. Ex. Potato.
6. *Granulated*. Ex. Wood-Sorrel.
7. *Palmated*, or hand-shaped. Ex. Dahlia.
8. *Bulbous*. Ex. Crocus, Onion, Garlic.
9. *Repent*, or creeping. Ex. Mint, Grasses.
10. *Root not fixed*. Ex. Duck Meat.

Some plants live without roots, but absorb their nourishment from the air. Ex. House-Leek.

THE STEM OR TRUNK.

This is the ascending part of the plant. Its use is to elevate the flowers and fruit above the ground.

The word trunk includes all kinds of stems. Stems are of the following kinds.

1. *Caulis*, the main stem, or body of a tree. It is also

What part of a vegetable is the root? How do roots differ in respect to duration? What are the names of the differently formed roots, and what are examples of each?

applied to the corresponding part of other plants, except those of the grassy kind.

The stem may be succulent, woody, fleshy, or medullary, that is, containing a pith, or it may be empty, or hollow. This kind of stem is therefore subdivided as follows:

- (a) *Caulis ligneus*, woody stem. Ex. Oak, Birch.
- (b) *Caulis medulosus*, a pithy stem. Ex. Elder.
- (c) *Caulis tubulosus*, a hollow stem. Ex. Dill, Fennel.
- (d) *Caulis simplex*, a simple stem. Ex. Lily, Bamboo.
- (e) *Caulis ramosus*, a branched stem. Ex. Poplar, Oak.
- (f) *Caulis nudus*, a naked stem. Ex. Saltwort.
- (g) *Caulis perfoliatus*. Stem passing through a leaf. Ex. Bone-set, or Thoroughwort.
- (h) *Caulis colubilis*, a twining stem. Ex. Bean, Hop.

Some stems twine to the left, and others to the right. All stems of the same species twine in the same direction.

2. **CULMUS**, a *Straw*. The culm, not only includes the stems of the grasses, and grains, but also those of other plants which resemble these. Culms are of several kinds, as follows, viz.

- (a) *Articulated culm*, a jointed straw. Ex. Wheat.
- (b) *Geniculated culm*. A straw bent like the knee joint. Ex. Fox-tail Grass.
- (c) *Simple culm*. A culm without joints. Ex. Rush.

3. **SCAPE**. *Flower stem*. This is an upright stem, which springs from the root, and bears the flower and fruit, but not the leaves. Ex. Daffodil, Cowslip.

4. **STIPE**. The stipe is the stem of the Mushroom, or Fungus tribe. This term is also employed to express the little stem, or pillar, which elevates the down in the Dandelion, and Thistle.

5. **FROND**. This term is applied to such plants as have their stems and leaves in a single piece, as the Ferns. These plants bear their seeds on the backs of their fronds, or rolled up in them. It applies only to Cryptogamous plants.

6. **Peduncle**, or flower stalk. This stem shoots out from the limb, or twig of the tree, and bears the fruit only. The

What part of the plant is the stem? What are the different kinds of stems, and what are examples of each kind? What is a culm? What is a geniculated culm? What is a simple culm? What is a scape? What is a stipe? What is a frond? What part of a plant is the peduncle?

FOLIUM, A LEAF.

The leaf is that part of most vegetables which presents the greatest surface to the air. Leaves differ from each other in respect to substance, form, texture, color, surface, duration, &c.

Leaves are divided into two classes, viz. *simple* and *compound*.

Simple leaves. Leaves are called simple, when only one grows on the same petiole, or foot stalk; Ex. Cherry, Peach.

Simple leaves are of various forms, as *round, ovate, oblong, &c.*

Compound leaves. Leaves are said to be compound, when several grow on the same foot-stalk. These are called *leaflets*. Ex. Rose, Ash, Sumac.

The forms of compound leaves, or their modes of growth, are various, as *binate, ternate, pinnate, &c.*

The summits, or terminations of leaves, differ from each other, and the forms of these parts are distinguished by the terms, *acuminate, mucronate, &c.*

In respect to their surfaces, leaves are *smooth, velvety, nerved, &c.*

Leaves grow in several directions with respect to their stems. This circumstance affords the distinctions of *erect, horizontal, reclined &c.*

In respect to the manner, or situation of their attachment, leaves admit of several distinctions, such as *radical, alternate, opposite, &c.*

Some leaves are of immense size. Ex. Fan-Palm. Certain leaves are hollow, and contain water. Ex. Chinese Pitcher plant, Side-saddle flower.

What part is the petiole? What part of a plant is the leaf? How are the leaves divided? When are leaves called simple? When are leaves said to be compound?

ARMS OR APPENDAGES OF PLANTS.

Certain species of plants, are furnished with appendages called *arms*, or *provs*. In other species, these parts are entirely wanting. When present, they are often useful in the descriptive part of Botany, as a means of distinguishing one plant from another. These appendages are called

1. *Stipules*, which are small leaves, growing at the foot-stalks of the ordinary leaves. Ex. Pea, Rose, and Wild-Cherry.

2. *Bracts*, or floral leaves. These are attached to the flower-stalks, and are smaller, and of a different shape from the other leaves. Ex. Lime tree, Sage.

3. *Thorn*, or spine. This part originates in the wood. Ex. Thorn-bush, Locust. It sometimes disappears by culture.

4. *Prickle*, or briar. This arises from the bark of the plant, and never disappears by culture. Ex. Rose, Gooseberry.

5. *Tendril*. Clasper. This is the true fulcrum. Ex. Gourd, Grape vine, Pumpkin.

6. *Gland*. This is a small tumor which secretes some kind of fluid. It is situated on various parts of plants. Ex. Leaves of the Peach, and Plumb.

• 7. *Pubescence*. This term means the clothing of plants, such as hair, wool, down, &c. Ex. Mullein, Nettle, Peach.

THE FLOWER.

The parts which properly belong to the flower, are the Calyx, Corolla, Stamens, and Pistils. The Germen belongs both to the flower and fruit.

Calyx.

The calyx, or flower-cup, is of various shapes, and admits of the following divisions, viz.

1. *Perianth*. The calyx is so called when it surrounds the corolla, or flower. Ex. Pink, Rose, Currant,

2. *Involucre*. This calyx is placed below the flower, which it never surrounds. Ex. Dill, Parsnip, Fennel.

3. *Ament*, or catkin. Ex. Willow, Chestnut.

• What are stipules? What are bracts? How does a thorn differ from a prickle? What is a tendril? What is a gland? What are the parts properly belonging to the flower? Does the germen belong to the flower, or fruit?

4. *Spatha*, or sheath. Ex. Daffodil, Onion.
5. *Glume*, a husk. This is the calyx of the Oat, and many Grasses.
6. *Volva*, a wrapper. This at first covers the cap of the Mushroom, and afterwards contracts and forms a ring around its stipe.
7. *Calyptra*, a hood. Ex. Mosses.

Corolla.

The corolla is the delicate colored part of the flower. When this part consists of only one piece, it is called *monopetalous*.

Monopetalous corollas are of several kinds, viz.

Campanulate, bell-shaped. Ex. Bell-Flower.

Funnel-shaped. Ex. Tobacco, Morning Glory.

Wheel-shaped, rotate. Ex. Common Laurel.

Labiate, lip-shaped. Ex. Sage, Lavender.

Poly petalous corollas are of the following kinds, viz.

Butterfly-shaped. The petals of this corolla are named the *standard*, the *wings*, and the *keel*. Ex. The Pea, Bean.

Cross-shaped, or cruciform corolla. It consists of four petals. Ex. Mustard, Cress.

Nectary or Honey-Cup.

It does not always secrete the honey, and signifies any appendage to a flower which has no other name.

INFLORESCENCE.

This term signifies the mode of flowering. The kinds of inflorescence are the following.

1. *Terminal flower*. Ex. Peony, Pink.

2. *Umbel*. Inflorescence like the sticks of an umbrella. Plants of this kind are called *umbelliferous*. Ex. Cicuta, Carrot, Dill.

3. *Verticillate*, whorled. Ex. Motherwort, Mint.

4. *Racemus*, a cluster. Ex. Currant, Grape.

5. *Spike*. Flowers arranged along a common peduncle. Ex. Wheat, Barley, Hardhack.

6. *Corymb*. Ex. Yarrow, Aster.

7. *Fasciculus*, a tuft, or bundle. Ex. Sweet-William.

8. *Capitum*, a head. Ex. Teasel, Clover.

How is the calyx distinguished from the corolla? What part of a plant is the nectary? What is meant by inflorescence?

9. *Panicle*, a loose raceme. Ex. The Oat, and many of the Grasses.

10. *Thyrus*, a kind of panicle. Ex. Lilac.

11. *Spadix*. A spike with the flowers close together. Ex. Indian Turnip, Egyptian Lily.

FRUIT, OR SEED.

When the seed is enclosed, the whole is called the fruit. When the seed is naked, then this alone is called the fruit.

Pericarp, a general term for the seed vessel of every kind of fruit. It is of various forms, sizes, and textures, and therefore is distinguished by various names, of which the following are the most common.

1. *Capsule*. This kind of pericarp becomes dry when ripe, and opens by valves. Ex. Poppy, Flax.

2. *Silqua*, or pod. This is divided by a partition, which is the receptacle. Ex. Cabbage, Turnip.

3. *Silicle*, a little, or short pod. Ex. Satin Flower.

4. *Legume*. This has no division. Seeds attached to the margins of the valves. Ex. Pea, Bean.

5. *Follicle*, or bag. Ex. Milkweed, Perriwinkle.

6. *Drupe*. Stone fruit. Ex. Cherry, Plum, Peach.

7. *Nut*. One celled, dry, and bony. Ex. Walnut, Acorn.

8. *Bacca*, a berry. Ex. Currant, Gooseberry, Orange.

9. *Pomum*, an Apple. Pericarp fleshy, and without valves. Ex. Apple, Pear, Quince.

10. *Strobulus*, a cone. Ex. Pine, Fir.

11. *Compound Berry*. Many berries united into one mass. Ex. Blackberry, Raspberry.

The seed consists of the *albumen*, the *embryo*, and their *coverings*.

The covering, or integuments, is the skin which immediately surrounds the seed. In the Bean, and Pea, this covering bursts, when the seed begins to germinate.

Albumen or white. This furnishes the first nourishment to the young plant. Ex. Wheat.

What parts of the vegetable are called the fruit? What is the pericarp? Of how many parts does the seed consist, and what are their names?

Embryo. The embryo consists of the *cotyledons*, the *radicle* and the *plumula*.

Cotyledons. These are the seed lobes, and compose the principal parts of leguminous seeds, as Beans, and Peas. They form the two first leaves of the young plant.

Radicle, or young root. This is the part of the embryo which descends, or shoots into the ground, and forms the root.

Plumula. This is the ascending rudiment of the embryo. It forms the stem and branches of the plant.

Hilum, called the *scar*, or eye of the seed. It is the point of union between the seed and receptacle.

Pappus, egret, or down. The wings of the seed. Sometimes elevated by a stipe. Ex. Dandelion.

Sessile pappus. That is, attached to the seed. Ex. Thistle.

Plumose egret. Feathery pappus. Ex. Dandelion.

BUDS.

Buds are of three kinds.

1. *Leaf buds*, those containing leaves only.
2. *Fruit buds*, those containing fruit only.
3. *Mixed buds*, those containing fruit and leaves.

The use of the bud is to protect its contents from the cold of winter. In hot climates, no buds exist. Leaf buds are more extended, and their points sharper than flower buds.

Young leaves are folded in their buds in various ways. Some are doubled, others plaited, others rolled, &c.

Buds are complete individuals, as is shown by their growth, when taken from one tree and inserted into another.

CLASSIFICATION OF PLANTS.

The illustrations which we have given of the different parts of plants, in the foregoing pages, and the explanation of the terms by which they are designated, are the preparatory means by which the pupil will be enabled to understand a systematic arrangement of the vegetable kingdom, and ultimately to distinguish one species from another.

Considering the vast number of different plants which the fields, the woods, the meadows, and even the water present to us, it is obvious that we should never be able to remember their names, or qualities, or to communicate to others what we know concerning them, without some regular method of distinction. For instance, suppose the grain which we call *Wheat*, was lately discovered, and generally unknown, by what method could a person who knew nothing of Botany designate this plant so that it might be known from all others? Having written sheets on this grain, and described its root, stalk, spike and flowers, with all the minuteness of which common language is capable, there would still be wanting the distinctive marks by which *Wheat* can certainly be known from all other vegetables, and therefore, readers would be constantly liable to confound it with *Rye*, the grain which in general appearance it most resembles. But by a systematic arrangement of plants, together with the assistance of definite terms, which are applied to the peculiarities of each species, botanists are enabled to designate one plant from another in a few lines, and with the greatest certainty.

It is on such distinctive marks, or invariable peculiarities, that all the natural sciences are founded, and it may well excite our wonder that throughout all the kingdoms and orders of nature, men have been enabled to discover such peculiarities, as the foundation of scientific arrangements.

In Botany, there are two methods of arrangement, called the *natural*, and *artificial* methods. The most superficial observer, says Dr. Smith, must perceive something like the classification of nature. The Grasses, Umbelliferous plants, Mosses, Sea-weeds, Ferns, Liliaceous plants, Orchises, and Compound flowers, each constitute a family strikingly similar in form and qualities among themselves, and no less evidently distinct from all others. If the whole vegetable kingdom could with equal facility be distinguished into tribes, or classes, the study of Botany on such a plan would be no less easy than satisfactory. But as we proceed in this path, we soon find ourselves in a labyrinth. The natural orders and families of plants, so far from being connected in a regular series, approach one another by so many points, as to bewilder, instead of directing us.

What are the two methods of botanical arrangement called? What tribes of plants are mentioned as constituting natural classifications?

To one who has the science to learn, therefore, the natural method of arrangement cannot be studied to advantage, as it is by far more difficult than the artificial one. But notwithstanding this, philosophical, or professed botanists, who desire to gain a thorough knowledge of the vegetable kingdom, have ever considered the natural affinities of plants as the most interesting object of study, and indeed the ground work of systematic Botany.

The artificial method, now universally adopted, was invented by the great Linnæus, who was born in Sweden in 1707. Linnæus, was undoubtedly the most learned and profound of all naturalists. His system of Botany has remained with little alteration until this day, and his natural history arrangement of animals, fishes, insects, and shells, not only laid the foundation of our present knowledge of these subjects, but have stood as guides to all naturalists who have followed him. In some of these departments, it is true, that the extension of knowledge since his death, has discovered errors, and there have not been wanting new systems, on all these subjects, founded on the advancement of knowledge. But the most popular and simple methods of arrangement are still those of Linnæus.

By the Linnæan system, the vegetable kingdom is divided into 24 classes. These classes are distinguished from each other by the number, situation, or proportion of the stamens which their flowers contain, so that this arrangement is founded entirely on the flowers of the plants. It is necessary, therefore in order to ascertain the place of any plant in the arrangement, and consequently its name, that its flower should in the first place be obtained.

These classes are divided into *orders*, which are founded either in the number of the styles, or pistils the flowers contain; on the situation of the fruit; on the kind of pericarp; or on some other circumstance, which will be explained, when we come to illustrate this part of our subject.

The orders are next separated into *genera*, the names of which are generally arbitrary, that is, not dependent on

Which is said to be the most simple, the natural, or artificial method? By which method is the most complete knowledge of Botany to be obtained? What is said of Linnæus and his method? How is the vegetable kingdom divided, according to the Linnæan system? On what part of the plant is the Linnæan arrangement founded? How are the classes divided, and on what parts of the flower is the second division founded? What is the next division?

any botanical relation, or peculiarity of the plant. The names of some of the genera are however, founded on the supposed virtues of the plant, though such virtues are often unknown at the present day. Thus *Nasturtium* is so called from the effects of its acrimony on the nose, *nasus tortus*, signifying a *convulsed nose*, and *Peony* is named after the physician *Peon*, who is said to have cured *Pluto*, with this plant, of a wound inflicted by *Hercules*. Other of the generic names are borrowed from the fables of the poets, and other genera are named from their situations, or places of their growth. Thus *Nymphaea*, comes from *nymph*, the Naiad of streams, and *Anemone*, from a Greek word signifying *wind*, because it is said that this plant prefers hilly situations, which are exposed to the wind. But more recently it has been customary to name most of the newly discovered genera after some distinguished man, and especially thus to immortalize the names of eminent botanists. Thus *Jacksonia*, was named after Mr. Jackson, an English botanist, and *Bromelia*, in honor of *Olaus Bromel*, a Swede; *Linnaea*, after *Linnaeus*, &c.

The genera are sub-divided into species, the names of which are mostly derived from some circumstance by which the plants can be distinguished from each other. Perhaps such distinctions are, most frequently, founded on some difference in the form of the leaf, but the length of the stalk, the scent of the flower, or plant, or the place whence the species came, as well as a great variety of other circumstances, have been the foundations of specific names.

The well known genus, *Geranium*, of which there is a great number of species, affords an excellent illustration of this subject. As in several other genera, the species is frequently named after some plant, the leaf of which the leaves of the *Geranium* most resemble. This is an excellent mode of distinction, as it is permanent, and often so striking as not to be mistaken. Thus, in respect to the form of the leaf, we have the *Oak-leaved*, the *Crow-foot-leaved*, and the *Aconite-leaved*, *Geranium*; also, the *heart-leaved*, *jagged-leaved*, &c. In respect to the length, or other circumstance concerning the stalk, we have the *long-stalked*, the *thick-stalked*, and the *angular-stalked*, species.

On what are the names of the genera chiefly founded? What are the divisions of the genera called? From what circumstances do the genera derive their names?

With respect to the odor, there is the *Rose-scented*, the *Fish-scented*, the *Musk-scented*, and many others. With reference to localities, or places whence the species came, there is the *Siberian*, the *Canary*, the *Russian*, &c. And in honor of different persons, there are *Wildenow's*, *Barrington's*, *Watson's* *Geranium*, &c.

Now it is obvious that the most convenient, as well as most scientific name of a species is that which is founded on some invariable peculiarity belonging to the plant itself, since it can then form a part of the description, and thus become one of the means of distinction. For instance, the *Oak-leaved*, or the *Crowfoot-leaved* *Geranium* may readily be distinguished by these parts, without further examination; and he who has ever touched a *Fish-scented*, or an *Apple-scented* *Geranium*, will never be at a loss to distinguish these species, though growing with hundreds of others. But when species are named after their localities, or in honor of persons, their names can never be employed as a means of distinction. Thus, *Siberian*, or *Watson's* *Geranium*, expresses nothing which affords us the least information concerning the appearance or qualities of the plant.

These remarks extend equally to the genera, the names of which will often strike the pupil as extremely inappropriate and improper. Thus, *Linnæa* which we have stated was named after Linnæus, the father of scientific Botany, is a "depressed, abject, Lapland plant, long overlooked," and if known, affords nothing worthy of notice, except its name. What a pity that this name had not been given to some noble genus, generally known, like the *Calla*, or to one which presents striking singularities of appearance, or habit, like the *Aloe*, or *Cactus*. On the contrary, *Ambrosia*, a classical name, which signifies in heathen mythology, the "food of the divinities," is applied to a common weed, as mean and contemptible in its appearance, as it is worthless in its qualities, so that one species has obtained the vulgar name of *hog-weed*. Other misapplications of the same kind frequently occur in the nomenclature of Botany.

Many species of plants produce *varieties*; that is, some plants, from the same seed or root, will differ from each other in consequence of accidental causes. These differ-

What is the most convenient and scientific name of a species? Why would some peculiarity of the plant form the best specific name? What is said concerning the misapplications of Botanical names?

ences appear to depend on the mode of culture, richness of the soil, temperature of the climate, influence of the pollen of one plant on the stigma of another, &c. The changes thus produced, affect chiefly the magnitude, color, or number of petals of the flowers, the form of the leaves, the size, color, and taste of the fruit, and the qualities or form of the roots. But the seed of the species is never thus changed, always producing the original kind, and not the peculiarity of that variety from which it was taken. Thus the apple and pear produce innumerable varieties, in respect to form, color, and taste, but the species of each always remains the same. If several seeds from the same apple tree be planted, each new tree, thus produced, will probably bring forth fruit, which not only differs from that of the parent tree, but also from each other. Thus seeds from green sour apples will produce sweet red fruit, or the contrary. And so the seeds from large apples will produce, or *may* produce small fruit, and in like manner, seeds from small apples may produce large fruit. But though the apple and pear belong to the same genus, that is, *Pyrus*, no human means can change one into the other, that is, the seeds of the apple, though they may produce varieties which differ greatly from each other, never produce pears. In this respect the law of nature is as immutable as it is with respect to gravity, or to the rising and setting of the sun. In no instance has a new species ever been known to be produced by cultivation, mixture, or any other means. In some instances, *monsters*, differing greatly in many respects from the species, have been the product of art or intermixture, but these seldom or never bear seeds which are prolific. So that the established law of nature, though in appearance thus encroached upon, is never broken, but rather, in the sight of man, confirmed by such products. Were it otherwise, and were new species formed by intermixture, or by any other means, it is obvious that the face of nature would be constantly subject to entire revolutions, and that the trees of the forest, and the seed-bearing corn, as well as the more humble grass of the field, which are the same now that they were in the days of Noah, would, even since the days of

What is meant by varieties? What circumstances produce varieties? What parts are chiefly affected in the formation of varieties? Are the species ever changed by the circumstances which produce varieties? Have the species of plants ever been known to be changed by any circumstance whatever?

our forefathers, have many of them, become entirely extinct, and we should now have had a new vegetable kingdom, of which Linnæus and his immediate followers knew nothing. Since the creation, therefore, it is not probable that a new species has been formed, though there might have existed many before the flood which were then destroyed, and there are probably many still in existence of which we know nothing. But we must leave this fruitful subject to explain the Linnæan system.

We have stated that this system consists of 24 Classes, which are divided into Orders, the Orders into Genera, the Genera into Species, and the Species into Varieties, when they exist.

The first eleven classes are founded entirely on the number of stamens the flowers contain, and are distinguished by names, derived from the Greek, which express the number of these parts belonging to each class. The first class is named *Monandria*, which signifies *one stamen*, being compounded of the Greek words *monos*, one, and *aner* a stamen. The second class in like manner, signifies two stamens, and is called *Diandria*, being composed of the words *dis*, twice, and *aner*, a stamen. *Monandria* therefore simply means one *stamen*, *Diandria* two *stamens*, and the next class *Triandria*, three *stamens*, and so on, to the tenth class, which of course has ten stamens.

This part of the classification is therefore extremely simple, and any child who reads it, and who has previously learned to distinguish the stamens, may immediately become a practical botanist; since all that is required, to refer a plant to its proper place in any of the classes, from the first to the tenth, is to count the stamens, and observe whether they are separate, and all of the same length. Thus if the flower has one stamen, he may know that it belongs to the class *Monandria*, if it has two, it belongs to *Diandria*, if three, *Triandria*, &c.

The nomenclature of the other classes will be explained in turn, and in connection with their illustrations; after which will be found a synopsis of the whole system; there being, we conceive, no advantage in forcing the pupil to

What would be the consequence of a change of species on the face of the earth? What is the foundation of the first eleven classes? How many stamens has the first class? How many the second? How many the third, &c.

burthen his memory with the names of the classes and orders in advance.

The *Orders* of the first thirteen classes are founded on the number of styles, or on the number of stigmas, when the styles are wanting. The names of these orders are therefore indicative of the number of pistils or stigmas which the flowers contain, as the names of the classes are of the number of stamens. The name of the first order in each of the thirteen classes is Monogynia, which word is derived from the Greek, *monòs*, one, and *gynè*, a pistil, and therefore means *one pistil*. The second order is also the same in most of the first thirteen classes. Its name, Digynia, is derived from *dis*, twice, and *gynè*, a pistil, and signifies two pistils. The third order is Trigynia, three pistils; the fourth, Tetragynia, four pistils, &c.

Nothing in the form of science, can be more simple or more easily understood, than the first half of the Linnæan system, both as respects the classes and orders. Thus if a flower has only one stamen and one pistil, it belongs to CLASS 1, Monandria, and ORDER 1, Monogynia. If it has one stamen and two pistils, it belongs to CLASS 1, Monandria, ORDER 2, Digynia. If it has two stamens, it belongs to CLASS 2, Diandria, its order being Monogynia, Digynia, or Trigynia, as it has one, two, or three pistils.

Having ascertained the class and order of a plant, its genus is the next subject of inquiry. A genus comprehends one, or more species. When a genus has only one species, the generic description is the description of that species. But when the genus includes many species, then the generic description is founded on such parts of the species as agree with each other. All generic descriptions, or essential characters, are founded on the flower, or parts of fructification. These descriptions are made as concise, and expressive as possible, so that in three or four lines, a genus may not only be completely described, so as to be identified, but also essentially distinguished from all other genera.

In botanical works, the large genera are usually separated into families, consisting of species which, in addition to their general agreement, with the characters of the genus,

What is the foundation of the orders of the first thirteen classes? What is the name of the first order in each of the thirteen first classes? What are the names of the second and third orders? If a plant has one stamen and one pistil to what class and order does it belong? Having ascertained the class and order of a plant, what is the next inquiry of the Botanist?

possess certain peculiarities in which they agree among themselves. In describing plants, all that is said of the classes and orders to which they belong, is merely to mention their names, it being understood that the reader will comprehend by the word Monandria, for instance, that the plant has one stamen, and by Monogynia, that it has one pistil, &c. The genus *Viola*, (or Violet,) for instance, is thus described. It falls under class 5, Pentandria, and order 1, Monogynia. Its division under this class and order is thus characterized: *Flower polypetalous, inferior, seeds in a capsule*. Then follows the generic description, or the terms which express the essential characters of this genus, viz. *sepals 5, petals 5, irregular, connate behind, anthers adhering by a membrane at the end, or distinct, capsules 3-valved, 1-seeded*.

By this scientific arrangement, the botanist instantly knows that all violets have five stamens, because it belongs to the class Pentandria, which word being derived from *pente*, five, and *aner*, a stamen, signifies this number. And because it is arranged under the order Monogynia, he knows, also, that it has only one pistil. The division of the order under which *Viola* is placed, shows that its flower is composed of many petals, this being the meaning of the word *polypetalous*, and by the term *inferior*, it is shown that the corolla is situated below the germen. By the phrase "*seeds in a capsule*," it is merely understood that the seeds of the Violet are contained in that kind of pericarp which becomes dry, and opens by valves.

The pupil will observe, that all this is indicated merely by the situation or place, which the genus *Viola* occupies in the systematic arrangement, and hence he will, it is hoped, become, in some degree, sensible of the advantages of method in the study of nature.

The generic description is easily understood. *Sepals*, it will be remembered, are the leaves of the calyx, and *petals* the divisions of the corolla. The corolla is called *irregular*, because the petals are unequal in size, or not symmetrical, and one of them also ends in an appendage or horn behind; *connate* means joined, and refers to the connected appearance of the petals. The other terms of the description need no explanation.

Does a genus include one or several species? On what parts of the plant are the generic descriptions founded? Why does the violet belong to the class Pentandria and order Monogynia? Why is it called polypetalous, and irregular? What is meant by connate?

The genus *Viola* includes a large number of species, which all agree in the above essential characters. These species are distinguished from each other, chiefly by the different forms of their leaves, or by some other circumstance, as formerly explained. Thus there is the *Viola odorata*, or sweet Violet, because its odor is pleasant; the *Viola dentata*, or toothed Violet, so called, because its leaves are dentated, or toothed on the margin, &c.

The description of the species, except where there are varieties, applies directly to each individual plant, and is supposed to be so accurate and discriminating as to leave no doubt of its identity. In the specific descriptions, nothing is said concerning those parts which indicate its place in the system. Thus the number of pistils and stamens, the form of the corolla and calyx, the kind of pericarp, and all other necessary circumstances concerning the flower and fruit, are implied, either by its place of arrangement, or by the terms in which the genus is described. The specific description, therefore, applies only to such parts of the plant as serve merely to distinguish one individual belonging to the same genus from another. Without a consideration of these circumstances, the pupil will often be surprised to find in botanical works, that the description of a species is contained in six or eight words only. Thus the species *Viola pedata*, or bird's-foot violet, is described by Linnæus in five words, "*stemless, leaves pedate, seven-parted.*"

EXAMINATION OF FLOWERS.

To find the name of an unknown plant, it is necessary to determine its place in the Linnæan System. This often requires a very close examination of all parts of the flower, and in many instances the addition of a good lens, together with the closest inspection of many specimens. With all these helps, the Botanist, without much practice, will sometimes find himself mistaken.

Tender, caducous flowers should be examined while growing, or immediately after they are plucked, otherwise

What is understood by "seeds in a capsule?" How are the species of the genus *viola* distinguished?

their parts will become indistinct by withering, and occasion additional perplexity. Small flowers should be examined by means of a lens.

1. In the first ten classes the parts which claim the principal attention are the stamens and pistils, and here to determine the class and order, little or nothing more is required than to ascertain the number of these parts. Thus if the flower has five stamens it belongs to **PENTANDRIA**, and if it has only a single style it belongs to the order **MONOGYNIA**, &c.

2. In the examination of the calyx and corolla, for the purpose of determining the genus, much caution is necessary lest the number of divisions in the first, should be mistaken for the number of sepals, and those of the second for the number of petals. In the first place, examine the corolla by pulling off each petal, or division separately. If it is found that they cohere, or grow together at the base, the corolla is monopetalous, and the petals instead of being distinct parts, as in a polypetalous corolla, are merely deep divisions. The flower of the Iris, for example, might easily be mistaken for a corolla with six petals. See p. 60, and Fig. 114.

3. The corolla being examined and removed, the calyx, if deeply divided, should be inspected in the same manner. Every calyx, the leaves or sepals of which are joined at the base, is *monophyllus*, or single leaved, however deeply it may be divided. In the Violet, for example, the calyx consists of five sepals, each of which may be removed separately, and without disturbing the others. In the Rose and Apple, the calyx is five cleft, the divisions all being united at the base. In the Violet, therefore, the calyx is *polyophyllus*, or *polysepalous*. In the Rose, it is *monosepalous*.

4. In many flowers the stigmas are so elongated, or deeply cleft, as easily to be mistaken for styles. It is necessary, therefore, in the examination of these parts, to ascertain whether they unite below, in which case only one style is to be counted. The Iris has three petaloid stigmas, but only a single style.

5. In many of the classes, particularly in the fifth, sixth, and tenth, the genera are often in part distinguished by the *superior* or *inferior* situation of the calyx, or corolla, or of both. Sometimes, also, these parts are *half superior*. These points are easily determined. When the calyx, or

corolla, is situated below the ovarium, or germen, or includes this part within its whorl, then the calyx, or corolla, is *inferior*. Ex. Lily, Pink.

When the calyx, or corolla, is placed on the ovarium, and does not include it, then it is *superior*. Ex. Apple, Hydrangea.

When the ovarium is partly above and partly below the corolla, or calyx, then these parts are *half superior*, or *half inferior*.

6. In the examination of flowers containing many stamens, it is required to ascertain whether these parts are situated on the calyx, or not. If there are many stamens, that is, more than twenty, inserted on the calyx, the plant falls under the class ICOSANDRIA; but if these parts are fixed under the ovarium, and on the part sometimes called the *receptacle*, it comes within the class POLYANDRIA.

7. If the flower has four stamens, two of which are longer than the others, it belongs to the class DIDYNAMIA. Plants of this description form the natural order called the *Labiata*, or *Mint tribe*. The flowers often grow in whorls, and are readily known by their labiate, gaping corollas. See Fig. 112.

8. If the flower has six stamens, two of which are distinctly shorter than the others, it falls within the class TETRADYNAMIA. Plants of this description, form the natural order *Crucifera*, or cruciform plants, so called, because their petals, being only four in number, are so placed as to make the figure of a cross. Cabbage and Mustard, are examples. See Fig. 116.

9. It is generally easy to decide whether the filaments are separate at the base, or united. In the first ten classes these parts are distinct throughout. If they are united together in any part of their length, or at the base, then the plant falls under some class not yet mentioned. If the union is in one parcel the flower is MONODELPHOUS. Ex. Geranium, Mallows. If the stamens have their filaments collected into two parcels, however unequal in number, the flower is DIADELPHOUS. In the Pea, for example, there are ten stamens, nine of which are in one set, and one in the other.

In a few instances the filaments are united into more than two parcels, in which case the plant falls within the class POLYDELPHIA. Ex. Hypericum.

10. In the examination of the compound flowers, the beginner may find some difficulty in distinguishing the parts from each other in such a manner as to satisfy himself concerning the orders. But the mode of examination is so simple as hardly to require any directions, since most that is required is to distinguish the *stamens* from the *pistils*, the *disk* from the *ray*, and the *tubular* from the *ligulate* florets. With respect to distinguishing the genera there is more difficulty, since it requires considerable practice to decide, when the involucre is *oblong*, or *conical*, *ventricose*, or *globose*, *ovate*, or *cylindrical*; or when the receptacle is *palaeaceous*, or *villous*, &c. and to point out the difference of the species from each other, as indicated by these terms. Nor is there any means by which this kind of knowledge can be obtained except by actual practice.

11. In the class GYNANDRIA, the flowers are so peculiar that the pupil after having examined a few specimens, will in general be able to refer the others to their proper place. Nearly all the plants of this class belong to ORDER 1st. The stamens, instead of being situated around the ovarium, or style, as in the other classes, are in this, situated on the style itself. Nor do they resemble these parts in other plants, but consist of solitary, fleshy, undivided processes, or masses, which appear more like the nectaries of other plants, than like the organs of re-production.

12. In the class MONÆCIA, where the stamens and pistils reside in different flowers, the difference between them is often quite obvious. The pupil, on gathering several flowers of this class from the same plant and comparing them with the descriptions of genera, will soon learn to distinguish the barren from the fertile flowers.

13. With respect to the class DIÆCIA, there is often very little difference in the appearance of the barren and fruitful aments, except the presence of the pollen. On examination, however, with the assistance of Botanical descriptions, the pupil will soon be enabled to distinguish the stamiferous from the pistiliferous trees, and the satisfaction of doing so, will amply repay him for his labor, since this class contains some of the most lofty and noble plants in the vegetable kingdom.

NAMES OF THE CLASSES AND ORDERS

OF THE LINNÆAN SYSTEM,

Illustrated chiefly by examples of the most common North American Plants.

CLASS I.—MONANDRIA. 1 Stamen. ORDERS 2.

ORDER 1.—MONOGYNIA. One Style.

Ex. *Salicornia*, (*Glasswort*),

Hippuris, (*Mare's tail*.)

ORDER 2.—DIGYNIA. Two Styles.

Ex. *Callitriche*, (*Water Starwort*),

Blitum, (*Strawberry Blite*.)

CLASS II.—DIANDRIA. 2 Stamens. ORDERS 3.

ORDER 1.—MONOGYNIA. One Style.

Ex. *Veronica*, (*Speedwell*),

Utricularia, (*Bladderwort*),

Collinsonia, (*Horse weed*),

Lemna, (*Duck meat*.)

ORDER 3.—TRIANDRIA. Three Styles.

Ex. *Piper*, (*Black Pepper*.)

CLASS III.—TRIANDRIA. 3 Stamens. ORDERS 3.

ORDER 1.—MONOGYNIA. One Style.

Ex. *Iris*, (*Flower-de-luce*),

Scirpus, (*Club-rush*.)

ORDER 2.—DIGYNIA. Two Styles.

Ex. *Triticum*, (*Wheat*),

Leersia, (*Rice-grass*),

Agrostis, (*Bent-grass*.)

ORDER 3.—TRIGYNIA. Three Styles.

Ex. *Lechea*, (*Pin-weed*),

Mollugo, (*Carpet-weed*.)

CLASS IV.—TETRANDRIA. 4 Stamens. ORDERS 3.

ORDER 1.—MONOGYNIA. One Style.

Ex. *Plantago*, (*Plantain*),

Cornus, (*Dog-wood*),

Mitchella, (*Chequer-berry*.)

ORDER 2.—DIGYNIA. Two Styles.

Ex. *Hamamelis*, (*Witch-Hazel*.)

Sanguisorba, (*Canada Burnet*.)

ORDER 3.—TETRAGYNIA. Four Styles.

- Ex. *Ilex*, (*Holly*,)
Potamogeton, (*Pond-weed*.)

CLASS V.—PENTANDRIA. 5. *Stamens*. ORDERS 7.

ORDER 1.—MONOGYNIA. One Style.

- Ex. *Lysimachia*, (*Loosestrife*,)
Datura, (*Thorn-Apple*,)
Verbascum, (*Mullein*,)
Viola, (*Violet*,)
Lobelia, (*Cardinal Flower*.)

ORDER 2.—DIGYNIA. Two Styles.

- Ex. *Asclepias*, (*Milkweed*,)
Gentiana, (*Gentian*,)
Chenopodium, (*Goose-foot*, *Pig-weed*,)
Daucus, (*Carrot*,)
Cicuta, (*American Hemlock*,)
Uraspermum, (*Sweet Cicely*.)

ORDER 3.—TRIGYNIA. Three Styles.

- Ex. *Staphylea*. (*Bladder tree*,)
Rhus, (*Sumac*,)
Viburnum, (*Arrow wood*.)

ORDER 4.—TETRAGYNIA. Four Styles.

- Ex. *Parnassia*, (*Grass of Parnassus*.)

ORDER 5.—PENTAGYNIA. Five Styles.

- Ex. *Linum*, (*Flax*,)
Statice, (*Marsh Rosemary*,)
Armeria, (*Thrift*.)

ORDER 6.—HEXAGYNIA. Six Styles.

- Ex. *Drosera*, (*Sun-dew*.)

ORDER 7.—POLYGYNIA. Many Styles.

- Ex. *Xanthoriza*, (*Yellow-root*.)

CLASS VI.—HEXANDRIA, 6 *Stamens*. ORDERS 5.

ORDER 1.—MONOGYNIA. One Style.

- Ex. *Lilium*, (*Lily*,)
Convallaria, (*Solomon's Seal*,)
Erythronium, (*Dog's-tooth Violet*,)
Orontium, (*Golden Club*.)

ORDER 2.—DIGYNIA. Two Styles.

- Ex. *Oryza*, (*Rice*.)

ORDER 3.—TRIGYNIA. Three Styles.

- Ex. *Medeola*, (*Cucumber root*,)
Rumex, (*Dock*.)

ORDER 4.—TETRAGYNIA. Four Styles.

Ex. *Saururus*, (*Lizard's tail*.)

ORDER 5.—POLYGYNIA. Many Styles.

Ex. *Alisma*, (*Water Plantain*.)

CLASS VII.—HEPTANDRIA. 7 Stamens. ORDERS 4.

ORDER 1.—MONOGYNIA. One Style.

Ex. *Trientalis*, (*Chickweed-wintergreen*.)*Æsculus*, (*Horse Chestnut*.)

CLASS VIII.—OCTANDRIA. 8 Stamens. ORDERS 4.

ORDER 1.—MONOGYNIA. One Style.

Ex. *Epilobium*, (*Willow-herb*.)*Oxycoccus*, (*Cranberry*.)

ORDER 2.—DIGYNIA. Two Styles.

Ex. *Chrysosplenium*, (*Golden Saxifrage*.)

ORDER 3.—TRIGYNIA. Three Styles.

Ex. *Polygonum*, (*Knot Grass*.)

CLASS IX.—ENNEANDRIA. 9 Stamens. ORDERS 3.

ORDER 1.—MONOGYNIA. One Style.

Ex. *Laurus*, (*Sassafras, Spice bush*.)

ORDER 3.—TRIGYNIA. Three Styles.

Ex. *Rheum*, (*Rhubarb*.)

CLASS X.—DECANDRIA. 10 Stamens. ORDERS 5.

ORDER 1.—MONOGYNIA. One Style.

Ex. *Kalmia*, (*Laurel, Ivy*.)*Pyrola*, (*Wintergreen*.)*Gaultheria*, (*Partridge-berry*.)

ORDER 2.—DIGYNIA. Two Styles.

Ex. *Saxifraga*, (*Saxifrage*.)*Saponaria*, (*Soap wort*.)

ORDER 3.—TRIGYNIA. Three Styles.

Ex. *Stellaria*, (*Chickweed*.)*Arenaria*, (*Sandwort*.)

ORDER 5.—PENTAGYNIA. Five Styles.

Ex. *Spergula*, (*Corn Spurrey*.)*Penthorum*, (*Five Horns*.)

ORDER 10.—DECAGYNIA. Ten Styles.

Ex. *Phytolacca*, (*Poke, or Scape*.)

CLASS XI. DODECANDRIA. 12 Stamens. ORDERS 5.

ORDER 1.—MONOGYNIA. One Style.

Ex. *Asarum*, (*Wild Ginger*.)*Portulacca*, (*Purslane*.)

ORDER 2.—DIGYNIA. Two Styles.

Ex. Agrimonia, (*Agrimony.*)

ORDER 2.—TRIGYNIA. Three Styles.

Ex. Euphorbia, (*Spurge.*)CLASS XII.—ICOSANDRIA. *Twenty or more stamens inserted on the calyx.* ORDERS 3.

ORDER 1.—MONOGYNIA. One Style.

Ex. Prunus, (*Wild Cherry.*)Cactus, (*Prickly Pear.*)

ORDER 2.—DIGYNIA. Two Styles.

Ex. Cratægus, (*Thorn bush.*)

ORDER 3.—TRIGYNIA. Three Styles.

Ex. Sorbus, (*Mountain Ash.*)

ORDER 5.—PENTAGYNIA. Five Styles.

Ex. Pyrus, (*Apple, Pear.*)Spiræa, (*Meadow Sweet.*)

ORDER 6.—POLYGINIA. Many Styles.

Ex. Rosa, (*Rose.*)Rubus, (*Blackberry, Raspberry.*)Geum, (*Arcus.*)CLASS XIII.—POLYANDRIA. *Many Stamens.* ORDERS 7.

ORDER 1.—MONOGYNIA. One Style.

Ex. Sarracenia, (*Side Saddle Flower.*)Sanguinaria, (*Bloodroot.*)Tilia, (*Basswood.*)Nymphaea, (*Water Lily*)

ORDER 5.—PENTAGYNIA. Five Styles.

Ex. Aquilegia, (*Columbine.*)

ORDER 6.—POLYGINIA. Many Styles.

Ex. Clematis, (*Virgin's Bower.*)Coptis, (*Gold Thread.*)Ranunculus, (*Crowfoot.*)CLASS XIV.—DIDYNAMIA. *Four Stamens, two of which are longer than the others.* ORDERS 2.

ORDER 1.—GYMNOSPERMIA. Seeds naked.

A. *Calyxes mostly five cleft.*Ex. Mentha, (*Mint.*)Verbena, (*Vervain.*)Leonurus, (*Motherwort.*)B. *Calyxes two-lipped.*Ex. Scutellaria, (*Scullcap.*)Prunella, (*Self-heal.*)

ORDER 2.—ANGIOSPERMIA. *Seeds in a vessel.*

- Ex. *Bartsia*, (*Painted Cup*,)
Pedicularis, (*Lousewort*,)
Mimulus, (*Monkey Flower*,)
Chelone, (*Snake-head*.)

CLASS XV.—TETRADYNAMIA. *Six stamens. four long and two short.* ORDERS 2.

ORDER 1.—SILICULOSA. *Seeds in a short pod.*

- Ex. *Lepidium*, (*Pepper-grass*,)
Thlaspi, (*Shepherd's Purse*.)

ORDER 2.—SILIUOSA. *Seeds in a long pod.*

- Ex. *Sinapis*, (*Mustard*,)
Raphanus, (*Radish*,)
Dentaria, (*Toothwort*.)

CLASS XVI.—MONADELPHIA. *Filaments united, at least through a part of their length, into one parcel.* ORDERS 7.

ORDER 1.—TRIANDRIA. *Three Stamens.*

- Ex. *Sisyrinchium*, (*Blue-eyed grass*.)

ORDER 5.—PENTANDRIA. *Five Stamens.*

- Ex. *Passiflora*, (*Passion flower*.)

ORDER 10.—DECANDRIA. *Ten Stamens.*

- Ex. *Geranium*, (*Cranesbill*.)

ORDER 11.—POLYANDRIA. *Many Stamens.*

- Ex. *Sida*, (*Indian Mallow*,)
Malva, (*Mallow*,)
Hibiscus, (*Hibiscus*.)

CLASS XVII.—DIADELPHIA. *Stamens united into two distinct parcels or sets.* ORDERS 4.

ORDER 2.—HEXANDRIA. *Six Stamens.*

- Ex. *Fumaria*, (*Fumatory*,)
Corydalis, (*Corydalis*.)

ORDER 3.—OCTANDRIA. *Eight Stamens.*

- Ex. *Polygala*, (*Milkwort*, *Snakeroot*.)

ORDER 4.—DECANDRIA. *Ten Stamens.*

- Ex. *Crotalaria*, (*Rattle-pod*,)
Phaseolus, (*Kidney Bean*,)
Trifolium, (*Clover*,)
Robinia, (*Locust tree*.)

CLASS XVIII.—POLYDELPHIA. *Stamens united into more than two parcels.* ORDERS 3.

ORDER POLYANDRIA. *Many Stamens.*

- Ex. *Hypericum*, (*St. John's wort*,)
Citrus, (*Orange*, *Lemon*.)

CLASS XIX.—SYNGENSIA. *Anthers united by their edges into a cylinder. Flowers compound, or collected into heads. ORDERS 5.*

ORDER 1.—ÆQUALIS. *Florets of the disk and ray all fertile, being furnished with stamens and pistils.*

A. *Florets all ligulate, or strap-shaped.*

Ex. *Leontodon, (Dandelion,)*

Lactuca, (Lettuce,)

Hieracium, (Hawkweed.)

B. *Florets all tubular and erect, forming nearly a level top.*

Ex. *Eupatorium, (Boneset,)*

Bidens, (Burr-marygold.)

ORDER 2.—SUPERFLUA. *Florets of the ray obsolete; those of the disk with pistils and stamens; all fertile.*

Ex. *Artemisia, (Wormwood,)*

Gnaphalium, (Life Everlasting.)

C. *Florets, radiate and ligulate.*

Ex. *Aster, (Starwort,)*

Solidago, (Golden rod,)

Senecio, (Groundsel,)

Anthemis, (Mayweed.)

ORDER 3.—FRUSTRANEA. *Florets of the disk with stamens and pistils, and fertile; those of the ray with stamens only, and barren.*

Ex. *Helianthus, (Sun-flower,)*

Coreopsis, (Tickseed-sun-flower,)

Rudbeckia, (Rudbeckia.)

ORDER 4.—NECESSARIA. *Florets of the disk with stamens but no pistils, and therefore barren; those of the ray with pistils only, and fertile.*

Ex. *Calendula, (Marygold,)*

Iva, (False Jesuit's Bark.)

ORDER 5.—SEGREGATA. *Besides the common involucre, each floret has its distinct perianth.*

Ex. *Elephantopus, (Elephant's foot,)*

Echinops, (Globe Thistle.)

CLASS XX.—GYNANDRIA. *Stamens placed on the pistil or germen. ORDERS 7.*

ORDER 1.—MONANDRIA. *One Stamen.*

A. *Anther, terminal, erect; pollen granular, cohering by an elastic thread.*

Ex. *Orchis, (Orchis,)*

Habernaria, (Habernaria.)

- . **B.** *Anther parallel with the stigma; pollen powdery.*
 Ex. *Neottia*, (*Bird's nest*,)
 Spiranthes, (*Ladies' tresses*.)
- C.** *Anther, terminal, persistent; pollen powdery.*
 Ex. *Arethusa*, (*Arethusa*,)
 Pogonia, (*Pogonia*,)
 Calopogon, (*Calopogon*.)
- D.** *Anther terminal, opercular, deciduous; pollen waxy.*
 Ex. *Cymbidium*, (*Tuberous Cymbidium*,)
 Malaxis, (*Malaxis*.)

ORDER 2.—DIANDRIA. Two Stamens.

- Ex. *Cypripedium*, (*Ladies' Slipper*.)

ORDER 3.—HEXANDRIA. Six Stamens.

- Ex. *Aristolochia*, (*Virginia snake root*.)

CLASS XXI.—MONOECIA. *Stamens and pistils in different flowers, but on the same plant, so that some flowers are fruitful, while others are barren.* ORDERS 8.

ORDER 1.—MONANDRIA. One Stamen.

- Ex. *Zostera*, (*Grass-wack, Eel-grass*,)
 Zannichellia, (*Horned pondweed*.)

ORDER 3.—TRIANDRIA. Three Stamens.

- Ex. *Eriocaulon*, (*Pipewort*,)
 Carex, (*Sedge Grass*,)
 Typha, (*Water Flag*,)
 Comptonia, (*Sweet Fern*,)
 Zea, (*Indian Corn*.)

ORDER 4.—TETRANDRIA. Four Stamens.

- Ex. *Alnus*, (*Common Alder*,)
 Urtica, (*Nettle*,)
 Morus, (*Mulberry*.)

ORDER 5.—PENTANDRIA. Five Stamens.

- Ex. *Ambrosia*, (*Bitter weed, Roman wormwood*,)
 Xanthium, (*Sea Burdock*.)

ORDER 6.—HEXANDRIA. Six Stamens.

- Ex. *Zizania*, (*Wild Rice, Water Oats*.)

ORDER 7.—POLYANDRIA. Many Stamens.

- Ex. *Sagittaria*, (*Arrow head*,)
 Arum, (*Indian Turnip*,)
 Castanea, (*Chestnut Tree*,)
 Quercus, (*Oak*,)
 Juglans, (*Walnut*.)

ORDER 8.—MONADELPHIA. *Stamens united into a single body.*

Ex. Pinus, (*Pine, Spruce,*)
Thuya, (*Hacmatac.*)

CLASS XXII.—DIOECIA. *Stamens and pistils on different plants, one being barren and the other fruitful.* ORDERS 8.

ORDER 2.—DIANDRIA. Two Stamens.

Ex. Vallisneria, (*Vallisneria,*)
Salix, (*Willow.*)

ORDER 3.—TRIANDRIA. Three Stamens.

Ex. Empetrum, (*Crowberry.*)

ORDER 4.—TETRANDRIA. Four Stamens.

Ex. Myrica, (*Bay-berry, Wax Myrtle.*)

ORDER 5.—PENTANDRIA. Five Stamens.

Ex. Humulus, (*Common Hop,*)
Acnida, (*Acnida.*)

ORDER 6.—HEXANDRIA. Six Stamens.

Ex. Smilax, (*Green Briar,*)
Dioscoria, (*Dioscoria.*)

ORDER 7.—OCTANDRIA. Eight Stamens.

Ex. Populus, (*Poplar,*)
Diospyrus, (*Persimmon.*)

ORDER 8.—ENNEANDRIA. Nine Stamens.

Ex. Elodea, (*Elodea.*)

ORDER 9.—DECANDRIA. Ten Stamens.

Ex. Gymnocladus, (*Coffee-bean tree.*)

ORDER 10.—POLYANDRIA. Many Stamens.

Ex. Menispermum, (*Moonseed.*)

ORDER 11.—MONADELPHIA. *Stamens united into one body.*

Ex. Juniperus, (*Juniper, Red Cedar.*)
Taxus, (*Dwarf Yew.*)

CLASS XXIII.—POLYGAMIA. *Perfect flowers together with barren, or fertile ones, or both, on the same, or on separate plants.* ORDERS 3.

ORDER 1.—MONOECIA. *Barren, fertile, and perfect flowers, on the same plant.*

Ex. Veratrum, (*Hellebore,*)
Celtis, (*Nettle-tree.*)

ORDER 2.—DIOECIA. *Barren, fertile, and perfect flowers on distinct plants.*

Ex. Panax, (*Ginseng.*)

- Xanthoxylum*, (*Prickly Ash*,)
- Acer*, (*Maple*,)
- Fraxinus*, (*Ash*.)

CLASS XXIV.—CRYPTOGAMIA. *Stamens and pistils concealed, imperfectly formed, or wanting.* **ORDERS 8.**

ORDER 1.—FILICES. *Ferns. Fruit mostly placed on the back of the frond.*

- Ex. *Polypodium*, (*Polypody*,)
- Osmunda*, (*Flowering Fern*,)
- Asplenium*, (*Shield fern*.)

ORDER 2.—EQUISETACEA. (*Horsetail*.)

- Ex. *Equisetum*, (*Scouring Rush*.)

ORDER 3.—LYCOPODINEÆ. (*Club Mosses*.) *Reproductive organs axillary, spiked. Theca in grains, or masses.*

- Ex. *Lycopodium*, (*Club Moss*.)

ORDER 4.—MUSCI. (*Mosses*.) *Dry herbs with distinct leaves, producing seed vessels, furnished with lids, and containing sporules.*

The Mosses belonging to this order are chiefly found in moist places in the woods, and in sheltered situations among the rocks.

ORDER 5.—HEPATICÆ. (*Liverworts*.) *Herb, a frond, the capsules not generally opening with a lid, as in the Mosses.*

These plants are chiefly found on rocks, old walls, and the bark of trees.

ORDER 6.—ALGÆ. (*Flags*.) *Seeds embedded in the substance of the frond; plants chiefly aquatic and submerged.*

- Ex. *Fucus nodosus*, (*Sea Rock Weed*.)

ORDER 7.—LICHENS. (*Rock and Tree Mosses*.) *Leafless, flowerless, perennial plants, with a thallus and external disk containing sporules.*

They are found on old wood fences, rocks, and the bark of trees.

- Ex. *Cetraria*, (*Iceland Moss*,)

Lecanora, (*Cudbear*.)

ORDER 8.—FUNGI. (*Mushrooms*.) *Sporules or seeds arranged in tubular cells, placed in some part of the external surface, often in the lamellæ, or gills. Frond none.*

- Ex. *Agaricus campestris*, (*Eatable Mushroom*.)

This order comprehends all the Mushrooms, vulgarly called *Toad-stools*, of which there are several thousand species and varieties.

Having made these explanations, it is hoped that the pupil will be enabled readily to understand the more extended illustrations of the classes and orders which are now immediately to follow.

CLASS I.—MONANDRIA. Stamen 1. Orders 2.

Fig. A. (The cuts which illustrate the first ten classes contain not only the number of stamens by which each class is characterized, but also one pistil each, so that the same cut illustrates the first order in every class. The stamen is marked a, and the pistil b.)



Monandria is not a large class, though it contains some plants of considerable value.

ORDER I.—MONOGYNIA. 1 Stamen. 1 Style.

To this class and order belong the natural tribe called *Scitaminea*, or the Ginger tribe, and which is considered one of the most beautiful families of the vegetable kingdom. The useful productions are the Ginger, Cardamon, and Turmeric, spices which are highly esteemed, and in general use. The *Salicornia*, or Saltwort, also belongs here, and is abundant on the sea-shores of New England.

GENUS *Zinziber*. Ginger. Its name is from the original Indian appellation. The root, which is very extensively employed in medicine and as a spice, is from the broad and narrow leaved species. These roots are prepared by being taken up when the stalks fade, and after being washed and scalded, are afterwards dried in the sun. This forms the black ginger. The white kind is not scalded, but only dried in the sun.

When the root is to be preserved in syrup, it is taken up and scalded before it is fully grown, and after being steeped and washed in water, it is put into jars and covered with a thin syrup—(*Brown's Jamaica*.) This root comes chiefly from the West Indies.

GENUS *Curcuma*. Turmeric. The name *Curcuma* is from the Arabic *kurkum*, or *kercum*. The part employed is the root, which is of a yellow color, and was formerly much employed in cookery to give a tinge to various dishes. There are a number of species belonging to this genus. That which is best known in this country is the long rooted Turmeric, and is used for coloring, and in medicine.

How many stamens and styles, or pistils, has a plant belonging to Monandria, Monogynia? What valuable plants are contained in this class? In what class and order does the ginger plant belong? What is the use of turmeric?

The roots of some species yield a starch, which, in some parts of the East Indies, is much used as food.

GENUS *Salicornia*. Saltwort. The name comes from *sal*, salt, and *cornu*, a horn. It is a plant without leaves, which grows abundantly on the sea coasts of some countries. There are several species, most of which are gathered and burned for the purpose of obtaining soda. One species is pickled for culinary purposes, like *samphire*, and hence this plant has been called *marsh samphire*. But the true samphire, *Crithmum*, is an unbelliferous plant of Europe, where it grows in inaccessible places among the rocks. Those who gather it are sometimes obliged to be let down in baskets, and it is in allusion to this circumstance that Shakspeare says,

“ Half way down
Hangs one that gathers samphire; dreadful trade!”

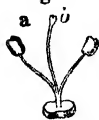
The *Salicornia herbacea* is found in various sea-coast places in this country.

ORDER II.—DIGYNIA. *Stamen* 1. *Styles* 2.

This order contains no plants of any note or value. The little aquatic plant, called water star-wort, (*Callitriche*,) is found in many places about our brooks, and belongs to this class and order. This is also the place of the Blite, (*Blitum*,) the heads of which stain the fingers, and were formerly used by English cooks to give their puddings a yellow tinge.

CLASS II.—DIANDRIA. *Stamens* 2. *Orders* 3.

Fig. B.



This class is not extensive, though it contains several genera of much importance, and some elegant and fragrant plants. The most useful of the class are the Pepper and the Olive. Sage and Rosemary also belong here, articles well known in cookery. The Syringa and Privet, are likewise esteemed as elegant flowering plants.

ORDER I.—MONOGYNIA. *Stamens* 2.* *Style* 1.

GENUS *Olea*, the Olive. The name is said to come from the Celtic word *olew*, oil. The full grown Olive tree is

In what situations does the *salicornia* grow? How many stamens has the class Diandria? How many orders has this class? What important plants belong to the second class?

about thirty feet in height, and is branchy, smooth, and evergreen. The genus contains a number of species, some of which are of little or no use. That which affords the pickle and oil is known by the name of the *Long-leaved Olive*. Both the pickles and oil come chiefly from Languedoc, Leghorn, and Naples. The best pickles are however said to come from Genoa and Marseilles. The longevity of the Olive is so great, that some plantations in Italy are said to have existed ever since the time of Pliny, that is, 1800 years. Olive oil is prepared by crushing the fruit to a paste, then pressing it through a woollen bag, adding hot water as long as any oil is produced. The oil is then skimmed off the water, and put up for sale.

Pickled Olives are prepared from unripe fruit, by repeatedly steeping them in water, to which quicklime is added, by which the process is shortened. Afterwards they are soaked in pure water, and then put into bottles with salt and water, with or without aromatics, and are then ready for sale. The Olive tree is propagated by large suckers or cuttings placed in deep trenches.

GENUS *Rosmarinus*. Rosemary. *Rosmarinus* comes from two Latin words, and signifies *the dew of the sea*. The plant is a perennial, labiate shrub, with the flowers growing in clusters around the stalk. The common kind yields a large quantity of fragrant oil, by distillation, which is well known under the name of the oil of Rosemary. In the language of flowers, Rosemary signifies *repentance*. It was, however, formerly considered as an emblem of fidelity in lovers. It was also worn at weddings and funerals, and is said still to be used in Wales on the latter occasions, and distributed among those who attend.

GENUS *Salvia*. Sage. The name of the genus comes from the Latin *salvere*, to save, on account of its supposed healing qualities. Botanists enumerate about 120 species, and several varieties of this genus. The plants are chiefly herbs and under shrubs, some of which are perennial, others biennial, and others annual. The leaves are generally rugose, or wrinkled, the smell aromatic, and the flowers in spikes. All the genus are easily cultivated, and the species so much resemble each other as to form one of the most natural tribes known to botanists. The Garden Sage, (*Sat-*

What is said of the longevity of the olive tree? Whence comes the name of sage? How many species of sage are enumerated?

ria officinalis.) is the species best known in this country. Of this there are several varieties, which differ in the size and form of the leaf. The Sage is a *labiate* plant, having but two stamens. In this respect it differs from most labiate flowers, which generally have four stamens, two long and two short, as will be seen when we come to the class Didynamia.

GENUS *Syringa*. Lilac. *Syringa* is said to be derived from a Turkish word signifying pipe, because the stems of their finest pipes are made of the roots of one of this species. *Lilac* is a Persian word signifying flower. All the species are deciduous shrubs, which bear beautiful, or sweet scented flowers. They are readily cultivated by suckers or roots.

GENUS *Catalpa*. This fine ornamental tree is a native of America and India. *Catalpa* is its native Indian name. Its leaves are large, and its profusion of white flowers gives it a striking appearance when in full bloom. In temperate climates, the flowers are succeeded by long pods, but in very cold climates, these do not appear.

ORDER II.—DIGYNIA. *Stamens* 2. *Styles* 2.

GENUS *Anthoxanthum*. Spring-Grass. The name of the genus means *yellow flower*, the spikes being yellow. It is this grass which gives the peculiar sweet, and delightful smell which we all so much admire in the new mown, drying hay. It is one of the earliest flowering grasses, grows about a foot high, has short, flat leaves, and solitary terminal spikes.

ORDER III.—TRIGYNIA. *Stamens* 2. *Styles* 3.

GENUS *Piper*. Pepper. *Piper* appears to come from *pippul*, the Bengalese name for the long pepper. Of this genus there are nearly sixty species. The plant is singular, as it has neither calyx, nor corolla. The fruit is borne on a spadix, which is simple, slender, and covered with flower-bearing scales. The leaves are large, generally on short petioles, in some of the species cordate, in others lanceolate, and in others ovate. Most of the plants are perennial herbs, but some of them are scandent, or climbing, as is the case with the black pepper, the species that furnishes the

What is said of the natural affinity of the different species of sage? What does the word lilac signify? What is the class and order of the plant which bears black pepper?

spice in common use at our tables. This plant (Fig. 154.)

Fig. 154. has a broad, ovate, acuminate, seven nerved leaf. It climbs on any rough barked tree, to which it attaches itself in a manner similar to our false grape or five leaved ivy, (*Ampelopsis*.) The fruit hangs in clusters as represented by the figure. On the pepper farms in the East, these plants are raised by placing two or three cuttings of pepper vines in the ground, six or eight feet apart; after which high stakes are driven down for them to climb upon. In Sumatra, quick growing trees are planted for this purpose. In three years these shoots bear, the berries being ripe and of a blood red color in September. The plants are then cut down to the ground, the berries gathered and dried in the sun. The roots then send out new shoots, which in three or four years more produce another crop.

There are two kinds of pepper in the shops, the black and the white. The black is the hottest, and is the dried berry in its natural state. The white, is the same berry steeped in water, and thus deprived of its skin.

CLASS III.—TRIANDRIA. *Stamens 3. Orders 3.*

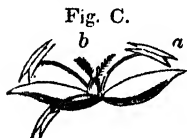


Fig. C. This class is larger than either of the preceding. It contains the Club-rushes, and most of the grasses, the irises, and many other common and well known genera. The grasses, it is well known, contribute more extensively to the support of domestic animals than any other order of plants. They are therefore a highly interesting tribe to the practical farmer and grazier, but possess few qualifications to attract the notice of the florist. The Club-rushes, which are also a numerous tribe, have in general still fewer attractions. These are ordinarily confounded with the grasses, to which they have a general resemblance. But the Club-rushes or Sedges have solid angular stalks, while the culms of the grasses are round and hollow. The grasses contain large quantities of sugar and other nutritive matter, while

Describe the mode of raising and curing black pepper in the East. How many Stamens has the class Triandria? What tribes of important plants does it contain? What is the difference in the composition of the grasses and the club rushes?

the Club-rushes are chiefly barren of nutriment, and hence are seldom preserved for fodder, and if preserved are seldom eaten. The *Iris* is a numerous and beautiful genus, besides which, the first order of this class contains the *Valerian*, *Crocus*, and *Papyrus*, all of which are interesting on different accounts.

ORDER I.—MONOGYNIA. *Stamens* 3. *Style* 1.

GENUS *Valeriana*. *Valerian*. Linnæus derives its name from king Valerius. This genus has a considerable number of species. The plants are perennial herbs, from one to three feet high, and bear their flowers in corymbs or panicles. One species only is worthy of notice. This is the great Wild Valerian, (*Valeriana officinalis*.) The root of this has a strong aromatic smell, and is a well known remedy in hysterical cases.

GENUS *Crocus*. This is an ancient name, being derived from the youth Crocus, who, as the heathen poets feigned, was turned into this flower. The genus is among the most ornamental of garden flowers, and some of the species are particular favorites on account of their early flowering, as well as their beauty. The useful species is the Saffron of apothecaries, (*Crocus sativus*,) which, as a medicine and a coloring drug, is well known. This differs widely in its habits from most of the other species. The Spring Crocus, (*Crocus vernus*,) sometimes appears in full bloom in the beginning of April, while the Saffron does not flower until September or October. The Spring Crocus is commonly propagated by its bulbous roots, but its varieties may be increased at pleasure by sowing its seeds.

GENUS *Iris*. This name signifies *rainbow*, so called on account of its variety of colors, and is the same under which it was known by Pliny, near two thousand years ago. It is known in this country under the name of *Flower-de-luce*. The genus is distinguished by having a six-parted flower, every other division of which is reflected, or rolled backward, the stigmas being shaped like petals. The genus presents sixty or seventy species, some of which are found in almost every country. They differ in size and appearance greatly, some being two or three feet high, while others are only as many inches. They are most of them pe-

•Whence does valerian derive its name? Whence does crocus derive its name? How may this plant be propagated? What does the name *Iris* signify? and why is the genus so called?

rennial herbaceous plants, many of which have bulbous roots, and are easily propagated either by the roots, or seeds. In this country, we have several indigenous species, one of which forms the chief ornament of our meadows and low grounds, and is generally known under the name of *blue flag*, or *Flower-de-luce*.

GENUS *Papyrus*. A word of obscure origin. The ancient *Papyrus*, (*Papyrus antiquorum*,) is a grassy, aquatic plant, which grows about ten feet high. The top spreads into a kind of umbel, composed of many long, narrow leaves. The lower part of the stalk is surrounded with long, sword-shaped leaves. This is the plant from which the celebrated *Papyrus* of the Egyptians, and other ancient nations, was obtained. Between the flesh and bark of the thick part of the stalk, there grows a membrane, which being stripped off in the form of narrow pieces, or ribbons, was united into sheets by pressure, and then dried in the sun. Many such sheets made the rolls on which the ancient manuscripts were written. The plant is indigenous in the swamps of Egypt and Ethiopia, and in England has been cultivated in cisterns of water, with rich mud at the bottom.

ORDER II.—DIGYNIA. *Stamens* 3. *Styles* 2.

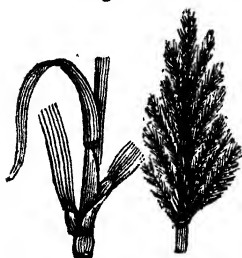
GENUS *Avena*. The Oat. The common Oat is a well known grain, which in this country is raised only as the food of horses. In some parts of Europe, it however forms a portion of the bread of the poor. It grows best in cold climates. The Wild Oat, called also the *hygrometic* Oat, (*Avena sterilis*,) has already been described as a curiosity, on account of its twisting and untwisting as it is exposed to dryness or moisture. This grows wild in most parts of North America.

GENUS *Triticum*. Wheat. *Triticum* is said to come from *tritum*, *tritum*, which signifies to wear down, or reduce to powder in a mortar, this being the original mode of converting Wheat into flour. There are at least fifteen species of Wheat, and perhaps many more. There are also several varieties of the common Wheat, some of which are preferred in one country, and some in another. This grain is almost every where cultivated, both in the temperate and torrid zones. It grows well on plains to the 45th degree of

What is said of the *papyrus*, and the mode of forming the rolls, on which ancient manuscripts were written? From what circumstance does *triticum* derive its name?

north latitude, and in southern latitudes it is raised 2000 feet above the level of the sea. The same weight of Wheat yields a greater quantity of flour than any other grain. It is also more nutritious than any other flour. The straw of Wheat is manufactured into hats and bonnets. It is said that the best straw for these purposes grows on dry, chalky lands. Leghorn hats are made from the straw of a bearded variety of Wheat which resembles Rye.

Fig. 155.



GENUS *Saccharum*, Fig. 155, Sugar Cane. Name from the Greek *sakkar*, which is said to come from the Arabic, *soukar*.

The character of the genus is, glume, two-valved, two-flowered, enclosed in long wool, flowers in a panicle, leaves flat. The stem of the Sugar Cane is a culm, so that with Wheat, Rye, Barley, &c. it is one of the *grasses*. The Sugar Cane was

unknown to the ancients, though of such vast importance in modern times. There are many varieties of this genus, both wild and cultivated, which grow in various parts of the East Indies. The species called the *Common Sugar Cane*, is that which is cultivated for the extraction of sugar. The first distinct account of this plant appears to be about the middle of the 12th century, just prior to which, the Venetians imported it from the vicinity of the Red Sea. Its native country is probably India. It is supposed to have been introduced into Sicily, Crete, and Rhodes, by the Saracens, as sugar was made in these islands about the middle of the 15th century, and before the discovery of the West Indies. The Dutch began to make sugar on the Island of St. Thomas, in 1610, and the English in Barbadoes, in 1643. Since these times the culture of the Sugar Cane has become general in nearly all warm climates, so that sugar now forms one of the first articles of commerce all over the world. It was first used in England in about 1466, when it was offered only at feasts, and employed in medicine. It was then, probably, imported from Sicily. In the West Indies it is

What is the derivation of *saccharum*? Was sugar known to the ancients or not? What is supposed to have been the native country of the sugar cane? When and where is sugar said to have been first manufactured? When was sugar first used in England?

propagated by cutting off the shoots near the root, which are inserted in hills or trenches. The cuttings take root at the joints under ground, and in about 12 months, become ten or twelve feet high, when they are cut down for the mill. A plantation lasts from six to ten years.

ORDER III.—TRIGYNIA. *Stamens* 3. *Styles* 3.

This order contains few plants, and none of any interest.

CLASS IV.—TETRANDRIA. *Stamens* 4. *Orders* 3.

Fig. D.



This class is neither so important, nor so large as the last. It is composed chiefly of ornamental, or curious shrubs, and is therefore interesting to the young florist. Many of the most important plants of this class are confined to the southern hemisphere. Among the ornamental, or useful genera which are generally known, are the Holly, (*Ilex*), the Madder, (*Rubia*), the Teasel, (*Dipsacus*), and the Sandal Wood, (*Santalum*.) The Ixora, and Pavetta, are beautiful, ornamental shrubs. These are hot-house plants. In this class all the stamens are of the same length; but there is less affinity in the appearance and qualities of the species, than in most of the other classes.

ORDER I.—MONOGYNIA. *Stamens* 4. *Style* 1.

This is a numerous order, and contains an assemblage of species which have little resemblance to each other. It is separated into eight divisions, founded on the absence or presence of a corolla, the number of petals it contains when present, its situation, whether *superior* or *inferior*, and the number of seeds contained in the cells of the capsules.

GENUS *Protea*. The name is derived from *Proteus*, the son of Ocean and Thetis, who is said to have assumed various forms. It is so named in allusion to the varieties of form and appearance of the species of this genus.

The genus has a calyx which is separable into two parts. Style, awl-shaped. Stigma, narrowly cylindrical. Nut, bearded on all sides. The plants are deciduous shrubs, from six inches to ten feet in height; the leaves and flowers

How many stamens has the class Tetrandria? Of what kind of plants is this class chiefly composed? What is said of the order Monogynia, of this class?

being of various forms and colors. They are all natives of the Cape of Good Hope, but many of them have been introduced into England, and cultivated in green-houses, on account of their singularity, or their beauty. They may be propagated by cuttings, taken off at the joints and placed in pots.

To this genus belongs the Silver Tree, (*Protea argentea*.) which is also found at the Cape, and no where else. Its leaves are soft and rich, with a surface like white satin, and when thrown into agitation by a breeze, are said to exhibit a splendid appearance. The Golden Proteus is another beautiful tree of the same tribe. The leaves of this are yellowish green, edged with scarlet, so that when agitated in the sun beams, they are said to resemble waves of fire.

GENUS *Banksia*. So named by Linnaeus, in honor of Sir Joseph Banks, Pres. Royal Society. It is a foreign genus, the species being found only in New Holland, and New South Wales. The species are nearly thirty, and most of them evergreen, hot-house plants. The flowers grow in heads, or bunches, chiefly at the tops of the plants, or ends of the branches. In most of the species, their color is yellow. This and the genus *Protea* are considered among the most beautiful genera known.

GENUS *Pothos*. From *potha* the native name of this plant in Ceylon. Most of the species climb up the trunks of trees, like ivy, and grow in hot climates. The Skunk Cabbage, (*Pothos fetida*.) or *Symplocarpus fetida*, is a species of this genus, which grows in the swamps of New-England.

The plant is repulsive on account of its smell, but the flower is a curiosity. It appears in April, in the form of a boat-shaped, inflated spathe, spotted with red and yellow. Within the spathe is an oval spadix of considerable size, covered with flowers in which will be found four stamens, and one pistil. After the flower has been some time in blossom, large, green, radical leaves appear, of an oblong, oval shape. These continue during the summer. The fruit is a large fleshy mass containing many round seeds.

GENUS *Dipsacus*. Teasel. *Dipsacus* is from the Greek, and signifies *to thirst*, because at the angle between the

•What is said of the genus *Protea*? Whence does *Banksia* derive its name?

leaves and stalk, there is a quantity of water which people may drink. There are several species of this genus, but that only which is useful is the *Dipsacus fullonum*, or clothier's Teasel. This is cultivated for raising a nap on cloth. The flower is terminal, and grows in a cylindrical head, the chaffs, or awns of which are furnished with hooks. When these are drawn along the cloth, they catch hold of its fibres, and thus as it is termed, *raise the nap*. The wild Teasel, it is said is not hooked.

GENUS *Rubia*. Madder. *Rubia*, from the Latin, *ruber*, red, because the root colors red.

The species *Rubia tinctorium*, or Dyer's Madder, is cultivated as an article of commerce, in various parts of the world. It has a weak stalk which trails upon the ground, or climbs up some support. Its roots are small, but several feet in length, and from these the scarlet dye of clothiers is chiefly made. When animals feed on Madder, their bones are colored red, and if the plant be alternately given and intermitted, their bones will be found in alternate red and white circles.

GENUS *Cornus*. Dogwood. *Cornus*, from *Cornu*, a horn, because the wood is hard and durable, like horn. Anciently this wood was used for warlike instruments. We have about twelve species of this genus in our woods. The larger kinds are very ornamental, especially the common Dogwood, (*Cornus florida*), which is a large shrub, growing every where in the woods. Its leaves are ovate, and acuminate. The flowers in heads, surrounded by large involucre, which are nearly white, and which give the tree a very showy appearance, particularly as it is in flower in May, while the green leaves of the other trees by which it is surrounded are just putting forth. The fruit is a red berry. The wood is hard and compact, and is sometimes employed by cabinet-makers, instead of box.

GENUS *Plantago*. Plantain. Of this there are forty or fifty species, some of which, the *broad* and *narrow* leaved Plantain, every one knows. The broad leaved, (*Plantago major*), grows about houses, and seems to thrive best when most trampled upon. This has from time immemorial been

What does the name *dipsacus* signify, and why was this genus so named? What use is made of the teasel. What curious effect does madder have on the bones of animals that eat it? What is the origin of the name *cornus*?

considered a remedy for cuts and wounds. Its spikes, growing on tough little rods, are probably well remembered by most country children.

The narrow leaved, (*Plantago lanceolata*), called also *ribwort*, is found abundantly in the fields. Its stalks are furrowed, and its leaves long and deeply ribbed. Spike dark colored, with white projecting stamens.

ORDER II.—DIGYNIA. *Stamens 4. Styles 2.*

This order contains but few genera, and these are mostly without much interest.

GENUS *Hamamelis*. Witch Hazle. This is a shrub, or bush, growing about the sides of fields, or borders of woods. The flowers are yellow, and in axillary bunches, or terminal. The singularity, or witchery of this species, consists in its putting forth its blossoms at the same time that its leaves are falling, and when the germens of all its neighbors have turned into pericarps. Loudon says, in New-England this tree has ripe fruit and fresh blossoms at the same time. It flowers in November and December, the fruit being produced the next year.

ORDER III.—TETRAGYNIA. *Stamens 4. Styles 4.*

This order is much more extensive than the last. It contains one important genus, the Holly, and one that is curious, but common, the Pond Weed.

GENUS *Ilex*. Holly. Origin of the name unknown. There are many species of this genus, but the common Holly, (*Ilex aquifolium*), is the most important. This is an evergreen shrub, or low tree, which displays almost any shape, or character, according to its situation, age, or training. The leaves are ovate, acute, spiny, and waved. The flowers are axillary, and in whorls, or short umbels. It is extensively employed in some countries for hedges, or fences. "The common prickly Holly," says Loudon, "makes the best of all hedges, whether we regard its qualities for defence, shelter, duration or beauty." The plants are raised from the seeds, which in general do not vegetate until the second year after their planting. The young shoots are then transplanted in rows, and as they grow, are trimmed, or shorn, according to the taste of the owner.

What singularity is there in the time of flowering of the witch hazle? In what respect is the *ilex* an important species?

CLASS V.—PENTANDRIA. *Stamens 5. Orders 7.*

Fig. E.



This is the most extensive of the Linnean classes, and contains about a fifth part of all *phenogamous* plants, that is, such as have visible pistils and stamens. It contains many of the most valuable plants, on account of their relation to the arts, and medicine. It also includes the umbelliferous tribe, among which are at once found some of the most deadly poisons, such as the Hemlock, (*Cicuta*), and some of the most agreeable spices, as the Coriander, and Caraway. Among others of this class, which are well known, we may notice the Potato and Egg Plant, (*Solanum*), Peruvian Bark, (*Cinchona*), the Coffee tree, the Guelder Rose, the Elder, Milk-weed, Tobacco, Mandrake, Grape Vine, Thorn Apple, (*Datura*), Mullein, Hen-bane, Red Pepper, (*Capsicum*), Currant, Goose-berry, Violet, Primrose, Morning Glory, Wild Honey-suckle, Cardinal Flower, (*Lobelia*), Touch-me-not, Cocks-comb, Gentian, Beet, Elm, Carrot, &c. &c.

The word Pentandria comes from the Greek, *pente*, five, and *aner*, a stamen, and merely signifies, in Botany, five stamens.

In this class the stamens are five in number, and all separate, as in Fig. E. By this circumstance, flowers belonging here, may be distinguished from those of class 19, Syngenesia, in which the stamens are also five, but are all united by their anthers, which adhere together. The Syngenesious flowers are also compound; that is, a number grow together on the same receptacle.

ORDER I.—MONOGYNIA. *Stamens 5. Style 1.*

This is the most extensive order in the class, and as it contains a great variety of plants which differ from each other, in various respects, it is divided into many sections, depending on some circumstance peculiar to one or more parts of the flower; to the kind of pericarp, or its number of cells; and sometimes to the shape of the fruit, &c. As we can give only an illustration or two, of each order, it is not necessary to insist on these divisions.

How many stamens has the class Pentandria? What is said of the extent of this class? What important genera are mentioned as belonging to this class? How are plants of this class distinguished from those of class 19?

GENUS *Symphytum*. Comfrey. The name of the genus comes from the Greek, and signifies *union*, or *junction*, because this plant has been a famous remedy for cuts and wounds. Comfrey has a tuberous root, is perennial, and grows two or three feet high. The common kind abounds in mucilage. All the species are large, coarse, and shrubby, but showy plants, which flower for two or three months in the year.

GENUS *Primula*. Primrose. *Primula* comes from *primus*, the first, because this plant flowers early in the spring. Some of the species (of which there are many) are evergreen plants, and some are deciduous herbs. They consist of dwarf mountain, or Alpine plants, which are great favorites, on account of their early flowering and beauty. They grow from three or four inches, to a foot in height, and bear flowers of various colors, as yellow, red, orange, or purple. The common kind, (*Primula vulgaris*.) has a single yellow flower; leaves oblong, obovate, toothed and wrinkled; petals five. The leaves and roots smell like aniseed, when dried, and are sometimes used as snuff for a sternutatory. Few plants have been more celebrated among florists than this. Several varieties have been produced by art, and rules written to assist the purchaser in his selections, as well as the seller in disposing of his goods. The *Auricula*, which belongs here, is a native of the Alpine regions of Italy, Switzerland, and Germany. The common colors in the wild state are yellow and red, but the colors of the cultivated kinds are innumerable, and some of the species are of exquisite beauty and fragrance. This is only three or four inches high, but supports many flowers

Fig. 156.



on the same stalk. Fig. 156. Loudon states, that in most of the manufacturing towns in England, and many in Scotland, the culture of this flower forms a favorite amusement of weavers, and mechanics. Lancashire has long been famous for its Auriculas. It is no uncommon thing there, for a working man who earns, perhaps, from 18 to 30 shillings per week, to give two guineas for a new variety of Auricula, with a view of crossing it with some other, and thus raising seedlings of new properties.

What is said of the extent of the order Monogynia, of this class? Whence comes the name of the primrose? What is said of the genus *primula*?

GENUS *Verbascum*. Mullein. *Verbascum* appears to be an alteration of *barbascum*, which comes from *barba*, a beard, with which the plant is covered. There are, perhaps, thirty species of Mullein, of which we have two or three in New England. Common Mullein, (*Verbascum thapsus*,) which every one knows, is from three to ten feet high, with a stock as large as one's wrist. The leaves of this are a common remedy for swelled faces, its action, (if it has any,) probably depending on the irritation which its beard occasions on the skin. Its long spike of golden blossoms makes this a handsome looking plant.

GENUS *Datura*. Thorn-apple. *Datura stramonium*, which is our common species, is a large, dark-colored, dangerous looking plant. It obtrudes itself into most people's barn or door yards, where if not destroyed before seed time, it disseminates itself in all directions. Every part of this plant is a strong poison, bringing on tremors, delirium, stupor, and death. Nevertheless, under proper regulations, and in small doses, *Datura* is a useful medicine in asthma, and some other diseases.

GENUS *Nicotiana*. Tobacco. So named from John Nicot, of Nismes, in Languedoc, ambassador from the king of France, to Portugal, who procured the seeds from a Dutchman who had received them from Florida, in America. The common name, *Tobacco*, comes from *Tobasco*, the name of a district in Mexico. There are about fifteen species of this genus, which vary in height from three inches to six feet. The species chiefly cultivated and which forms such a vast article in the commercial world, is the Virginian Tobacco, (*Nicotiana Tabacum*.) Perhaps no article of luxury has been so universally disseminated as this poisonous herb. "Tobacco, as used by man," says Du Tour, "gives pleasure to the savage and the philosopher; to the inhabitant of the burning desert and the frozen zone." Its use, either in powder to be taken into the nose, or in quids to be chewed, or to be inhaled in the form of smoke, is absolutely universal. Even the inhabitants of the newly discovered islands, have already learned to use this nauseous drug. And although deadly sickness follows the first at-

From what circumstance does *verbascum* obtain its name? What is said of the poisonous properties of thorn-apple? How does the genus *nicotiana* obtain its name? Whence comes the name *tobacco*? Of what country is *tobacco* a native? What is said concerning the dissemination and use of *tobacco*?

tempt, yet, as though spell bound, or hag beset, the experimenter, persevering, finally becomes his own victim. A hundred volumes, it is said, have been written against the use of Tobacco, of which a German has preserved the titles. Among these is the book of James Stuart, king of England, who, with all his might came out against it. The grand duke of Moscow forbade its entrance into his territory, under pain of the knout for the first offence, and death for the second. In like manner, the Grand Sultan, at Constantinople; pope Urban, at Rome; and the king of Persia, all issued, either firmans, bulls, or edicts, against it. But still, like a "dark walking" disease, the contagion caught, and the evil spread, until at present all the sovereigns of Europe, and most of the princes and governments of the earth, derive a considerable proportion of their revenues from Tobacco.

Tobacco was first carried to England from the island of Tobago, or from Tobasco, in Mexico, in 1586. The seeds were introduced some time afterwards. Sir Walter Raleigh was the first to introduce its use by smoking, which he had learned in Virginia; and in the house in which he lived at Islington, are still to be seen his arms, on a shield, with a Tobacco plant at the top.

GENUS *Atropa*. *Atropa* was one of the fates, whose duty it was to cut the thread of human life, and, says an author, "the fruit of this genus are well adapted to the fulfilling of her office." *Belladonna*, means *fine lady*, perhaps in allusion to its use as a wash to beautify the skin. The Deadly Nightshade, (*Atropa Belladonna*,) is a herbaceous, perennial plant, with smooth ovate leaves, and axillary flowers. It grows several feet high, and sends out many branches. The whole plant has a purplish tinge. The flowers are void of smell, and the berries, at first green, are, when ripe, of a beautiful shining black.

The whole plant, and especially the berries, are strongly poisonous when taken into the stomach.

GENUS *Solanum*. Nightshade. This extensive genus includes species which are extremely unlike each other. We have here the most important of all tubers, or perhaps to man, even the most necessary of all vegetables, the Potato. Then follow the Egg Plant, the Love Apple, (*Tomato*,)

What is said of the number of volumes which have been written against the use of this plant? When was tobacco first carried to England? What is the native country of the potato? What plants are associated in the same genus with the potato?

the Bittersweet, and more than a hundred other species of less note. The whole genus is however of little consequence, when compared with the single species first named.

The Potato, (*Solanum tuberosum*,) like Tobacco, is one of the native products of the New World. It appears to have been first discovered by Europeans in its wild, or native state, in the mountainous regions of South America, near Quito, where it has been lately ascertained to be still growing. How it found its way from Quito to Virginia, is unknown, but from Virginia it was carried to England by Sir Walter Raleigh, or some of his colonists in 1586. Our name, Potato, appears to have come from the Spanish *Potades*. The French called it *Pomme de Terre*, apple of the earth. The Sweet Potato is of a different genus, and was known long before the discovery of America. Gough, an old English author, says that Potatoes were first planted in Europe by Sir Walter Raleigh, on his estate near Cork. For many years they were used as delicacies, and not as common food. So late as Bradley's time, who died in 1732, Potatoes were reckoned inferior to radishes and skirrets. During the last thirty or forty years, the use of this root as common food has increased rapidly, until, at the present time, it is common in most of the colder parts of Europe, in North and South America, and in Australasia, but in Spain and the East and West Indies, it is little cultivated. The varieties of the Potato are almost as numerous as the districts where they are cultivated, and new varieties may at any time be produced by sowing the seed contained in the balls which grow on the vines, and which at first will produce only small tubers, but these being planted will yield a full crop the fourth year.

Tomato, (*Solanum lycopersicum*.) Love Apple. This is an annual plant, with jagged, or unequally winged leaves, which grows two or three feet high, and about the blossoms and upper leaves, appears somewhat like the potato. It bears a large glossy berry, deeply furrowed, which is at first green, but when ripe, turns of a beautiful red, similar to the great pepper, (*Capsicum*.) This berry, which is sometimes two inches in diameter, has been long employed in Italy and France, as an ingredient in sauces, stews and soups, and in

When was the potato first carried to England? How many new varieties of the potato be produced? What is said of the uses of the tomato and egg-plant?

this country it is already raised in the vicinity of most of the large towns for the same purpose, and is rapidly coming into general use. When picked green and thrown into vinegar, with spices, the Tomato makes excellent pickles. The seeds should be planted in a hot bed, in April, and transplanted into the garden in May.

The Egg-plant, (*Solanum melongena*), is a tender annual, herbaceous plant, about two feet high, and branched. The leaves are heart ovate and sinuate, and the stem prickly. The fruit is egg-shaped, with the small end upward; of a beautiful glossy purple, and from the size of the fist to that of a child's head. Inside it is fleshy, with sinuses containing small flat seeds. This fruit, when cut in slices, and fried in butter, or when stuffed and stewed in a certain manner, is a great delicacy. It is raised in the same manner as the Tomato, and is rapidly going into use in this country. It may be made an article of economy, as well as a luxury, for there are few plants which bear a greater weight of fruit according to their size.

GENUS *Convolvulus*. Bind-weed. *Convolvulus* is from the Latin *convolvere*, to entwine, because most of the genus are running vines. The Sweet Potato, (*Convolvulus batatas*), belongs here. Its vines run six or eight feet and cover the ground. Its leaves are heart-shaped, sinuate, and angular. This is a native of the East and West Indies, and of China. From these countries it has spread into all the tropical climates, which best suit its nature. It will however grow as high as latitude 42°, though not in much perfection.

Scammony, a gum resin, used in medicine, is the inspissated juice of the root of one species of this genus, (*Convolvulus scammonia*.)

GENUS *Capsicum*. Red pepper. This plant is too well known to require description. There are many kinds raised in our gardens, as the common, globular-fruited, heart-fruited, cherry-pepper, &c. These are all different species, as may be seen by the different shapes and sizes of their fruits. Some of these came originally from India, some from the West Indies, and others from China. The seeds and capsules of this tribe being dried and pulverized, form the well known, hot, biting condiment, sold under the name

To what genus does the sweet potato belong? How did lobelia obtain its name?

of *Cayenne Pepper*. For this purpose, however, the Bird Pepper, (*Capsicum baccatum*), is commonly employed. It is said that a mixture of sliced cucumbers, shallots, or onions, cut very small, a little lime juice, and Madeira wine, with a few pods of Bird Pepper, well mashed and mixed, seldom fail to provoke the most languid appetite, in the West Indies. The common *Capsicum*, called Squash Pepper, is cultivated for its green fruit, which is chiefly used in pickling.

GENUS *Campanula*. Bell-flower. *Campanula* means little bell, so named on account of the bell shaped corollas of this genus. The species are very numerous, and some of them beautiful. The Canterbury Bell, (*Campanula medium*), which bears a profusion of blue flowers, is well known, and is a general favorite. The varieties of this are double, with red, purple, or white flowers. Some species of this genus are annual, some are biennial, and others are perennial. They are cultivated chiefly as border flowers, and most of the species are very easily raised.

GENUS *Lobelia*. Name in honor of M. Lobel, physician and botanist to James I. of England. This genus furnishes some very splendid herbaceous plants. Of the forty or fifty species it contains, we have about ten in New England, and among these, one of the most beautiful, the Cardinal flower, (*Lobelia cardinalis*.) This superb species, which is cultivated and highly esteemed in England, is a native of this country, and is common about the sides of our brooks and ponds. It rises to the height of about two feet. Stem simple, or not branched; leaves alternate, lanceolate and serrate. The flowers are scarlet red, color very intense and brilliant, on which account it is, in some places, called *Eye-bright*. Terminal raceme, one-sided, flowers large, and showy at a distance.

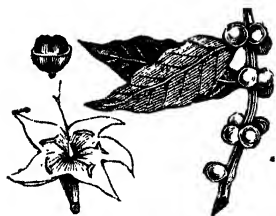
GENUS *Coffea*. Coffee-tree. *Coffea Arabica* is an erect conical shaped low tree, with a light brown bark, and opposite, oblong, shining, light green leaves; flowers in clusters at the base of the leaves, white, and of a grateful odor. The berries are at first green, but become red, when fully grown, and black, when ripe. It is a decoction of this berry that forms the well known beverage, called *coffee*, and which is said to have been drank in

What is the general character of this genus? When were the first coffee houses opened in Paris, and in London? What is the height and form of the coffee tree?

Ethiopia from time immemorial. It is probable that Ethiopia is the native country of the tree, and whence it was carried into Persia at a period unknown. It was introduced into Arabia from Persia about the middle of the 15th century, and from Arabia it was carried to Constantinople, where in 1554 there were two coffee houses. About the end of the 17th century the first coffee house was opened in Paris, but not succeeding, the keeper went to London, where, about this time, two coffee houses, or *sheds*, were opened. From this period the use of coffee gradually became general all over Europe, as it had been many years before in the Levant, and other parts of the East.

The Coffee Tree grows from five, to eighteen feet high, and bears in three or four years. The berry is chiefly raised for market, in the East and West Indies. The tree may be grown from the seed, if this is planted soon after it is ripe, but is said in six weeks to lose its vital powers. The berries are two-seeded; the seeds are convex on one side and flat on the other.

Fig. 157.



The figure, 157, shows the form of the leaf, the situation of the flowers, and separately, the form of the berry.

ORDER II.—DIGYNIA. *Stamens 5. Styles 2.*

This order is not nearly so numerous or important as the first, but it contains many genera of considerable consequence, either as food, medicine, or ornaments. The *Asclepias*, the singular genus *Stapelia*, *Gentian*, *Beet*, *Elm*, *Coriander*, *Chervil*, *Carrot*, *Cicuta*, &c. belong to this order.

GENUS *Asclepias*. Milkweed. It is named after an ancient physician, or physicians. This is a genus of plants which grow from two to four or five feet high, and several of them bear highly colored showy flowers. In England they are known under the name of *Swallow-wort*. In this country they bear the name of *Silk weed*, *Milk-*

What are the names of some of the most important plants of the 2nd order of this class? What is the botanical name of milkweed?

weed, and Pleurisy-root. Common Milk-weed, (*Asclepias Syriaca*,) is a well known vegetable, which springs up early in damp places, and is often cut down when young, and eaten like Asparagus. When ripe, the follicles of this plant contain large quantities of down, with which people sometimes fill their beds or pillows. The Pleurisy-root, (*Asclepias decumbens*,) has orange colored umbels, and grows in dry sandy places. The root has some medicinal virtues.

GENUS *Stapelia*. This genus was so called by Linnæus, in honor of Dr. Stapel, of Amsterdam. The plants are chiefly natives of the deserts of Africa, but many of them have been transplanted into the botanic gardens of London as great vegetable curiosities. The species vary from three inches to a foot in height, and are all of them entirely without leaves. Some of them bear flowers which are very large when compared with the size of the plant. These are yellow, purple, green, &c. The plants in general appearance resemble the Cactus, or Prickly Pear genus, the stems being large, fleshy, often covered with teeth or tubercles, and terminated abruptly. The flowers are supported by short peduncles which come out of the sides of the branches.

Fig. 158.



The figure, 158, represents the wart flowered Stapelia, (*Stapelia varrucosa*.)

GENUS *Gentiana*. Gentian. Name from *Gentius*, king of Illyria, who, according to Pliny, first discovered the tonic virtues of this genus. This is a handsome genus, the species of which vary in height from four inches to three feet. The flowers of some are campanulate, of others wheel-shaped, and of others funnel-shaped. The colors are blue, yellow, or purple. The species most employed in medicine, is the yellow Gentian, (*Gentiana lutea*,) the root of which is in common use as a tonic bitter in most parts of the world.

GENUS *Apium*. Parsley. *Apium*, is from the Celtic *apon*,

water, because the wild Parsley loves wet places. Common Parsley, which is in general use to communicate an agreeable flavor to soups, and *Celery*, a well known salad, are the two principal species of this genus.

Celery, (*Apium graveolens*.) is considered one of the most valuable of the salads, because it is eaten during the winter, when others are out of season. This is a remarkable instance of the effect of cultivation on a vegetable, the wild parsley being rank, coarse, hard, and entirely unfit to eat, while the *Celery* into which the gardener converts it, is sweet, crisp, juicy, and of a most agreeable flavor.

Fig. 159.

GENUS *Crithmum*, Fig. 159. Samphire.

Crithmum comes from a Greek word, signifying barley, because the seeds of this plant resemble grains of barley. Samphire grows about a foot high. Its stalk, and leaves are thick and fleshy, as shown in the figure, and it is found chiefly among cliffs near the seashore, though it may be cultivated in dry shady places, any where. The inhabitants, where it abounds, use it as a pot herb, and an ingredient in salads. But its chief use is that of a pickle. The Marsh Samphire, (*Salicornia*.) is a leafless plant and belongs to the class Monandria, while the real Samphire belongs to class V., and is an umbelliferous plant. These have sometimes been confounded, the name Samphire having been improperly applied to the former.

UMBELLIFEROUS TRIBE.

To this class and order belong chiefly that large natural tribe of plants called *umbelliferous*, so termed, as we have formerly explained, in consequence of their peculiar inflorescence. The *essential characters* of this natural order are *calyx* superior, either entire, or five toothed; *petals* five; *stamens* five, alternate with the petals; *seed* pendulous, usually adhering inseparably to the pericarpium; *plants* herbaceous, with hollow furrowed stems; *leaves* usually divided, sometimes simple, sheathing at the base; *flowers* in umbels, color white, pink, yellow or blue, generally surrounded by an involucre.—See *Lindley's Nat. System*.

These plants are chiefly natives of the northern parts of the northern hemisphere, inhabiting groves, thickets, plains,

What are the essential characters of the umbelliferous tribe?

marshes, and waste places. According to the investigations of Decandolle, the following is the proportion of the order of umbelliferous plants, found in different parts of the world, viz.

In the northern hemisphere,	679 species,
In the southern do.	205 do.
Of these, there are found,	
In the Old World,	- - 663 species,
In America,	- - 159 do.
In Australasia,	- - 54 do.
In scattered islands,	- 14 do.

From this we learn, that the species of umbelliferous plants known to botanists amount to nearly nine hundred, and it is probable that there are hundreds of species still undescribed and unknown.

In respect to the properties of this natural tribe, Dr. Lindley says they should be considered under two points of view, viz. those of the *vegetation* and those of the *fructification*. The character of the former is generally suspicious, and often poisonous in a high degree, as is the case of the herbage of Hemlock, Fools' Parsley, and others, which are deadly poisons. Nevertheless, the stems and leaves, (herbage,) of Parsley, Celery, and Samphire, and the roots of Carrot and Parsnip are wholesome articles of diet. The fruit, commonly called the seeds, are in no case dangerous, and is generally a warm and agreeable aromatic, as Caraway, Dill, Coriander, Anise, &c.

ORDER III.—TRIGYNIA. *Stamens 5. Styles 3.*

This order, when compared with the others already noticed, is small and contains but a few important genera. Of these the Sumac, Guelder Rose, and the Elder are among the most conspicuous.

GENUS *Sambucus*. Elder. The name is said to be derived from *Sambuca*, the Latin name of a wind instrument, usually made of the wood of this shrub. There are many foreign species of Elder, which are unknown in this country. The common European Elder, (*Sambucus nigra*.) is a showy tree, growing fifteen or twenty feet high; but except in size, it appears not to differ from our common spe-

Where is this tribe chiefly found? What number of umbelliferous plants are known to botanists? What are the most conspicuous plants of the order Trigynia?

cies, (*Sambucus canadensis*). The white flowers and black berries of our Elder, are both considered as possessing some medicinal properties.

GENUS *Rhus*. Sumac. The name *Rhus*, comes from the Celtic *rhudd*, signifying red, on account of the color of the fruit. This is a pretty extensive genus, and is widely disseminated. Many of the species are natives of the Cape of Good Hope, ten or twelve belong to North America, and others are scattered in different countries. Most of the species are shrubs, from two to eight feet high, but some of them are small trees, rising to fifteen, or twenty feet. Our common Sumac, (*Rhus glabrum*), is well known from the large bunches of red berries which it bears. These berries, with a mordant, are employed to color black. Poison Sumac, (*Rhus vernix*), is also a common species in our swamps. This grows twenty feet high. The wood and leaves are remarkably smooth, and it appears among its neighbors, rather like a stranger from the tropics, than a native plant. On some persons, the effluvia of this tree exerts a poisonous influence. The burning of a small stick or touching the green wood, or even passing by the growing tree, has in many instances, occasioned the most distressing eruptions on the skin, attended with swelling of the face, and other painful symptoms. On most persons, however, it has no such effect. The *Rhus vernix*, of Japan, is the tree that affords the true Japan varnish. This consists merely in the milky juice of the plant, which being spread on any kind of cabinet furniture, or other wood, gives the surface a beautifully transparent, and durable gloss. Whether this tree is identical with ours, has been a matter of dispute.

GENUS *Viburnum*. This genus consists entirely of ornamental shrubs, of which the Guelder Rose, (*Viburnum opulus*), and the Snowball tree, (*Viburnum roscum*), are among the most beautiful. The latter is merely a variety of the former, and produces large white flowers in the form of balls, resembling those of *Hydrangea*, and like them, these flowers are abortive, that is, they produce no fruit. In our woods we have five or six species of this genus, most of which flower in May and June.

• Whence does the genus *Sambucus* derive its name? What is said of the genus *Rhus*? To what class and order do the guelder rose, or *hydrangea*, and the snowball belong?

ORDER IV.—TETRAGYNIA. *Stamens 5. Styles 4.*

This order contains only two genera.

Fig. 160.



GENUS *Parnassia*, Fig. 160. Grass of Parnassus. Name, from Mount Parnassus, the abode of grace and beauty, where it is said this elegant little plant was first found. There are several species of this genus, of which two are natives of this country. The Carolina Parnassia is about six inches high, with radical leaves nearly orbicular, as represented in the drawing. The flower is white, single, and beset with nectaries, which might be mistaken for anthers.

ORDER V.—PENTAGYNIA. *Stamens 5. Styles 5.*

This order includes a considerable number of plants, among which we find Flax, and Sea Lavender.

GENUS *Linum*. Flax. *Linum* comes from the Celtic *Llin*, which signifies a thread. The genus contains a large number of species, but the only one of any considerable use is the common Flax, (*Linum usitatissimum*.) This has been cultivated for its thread, or fibre, from the remotest antiquity. Of what country it is a native, or whether it was not originally common to many countries, is at present unknown. The bodies of Egyptian mummies, said by certain proofs, to be more than 3000 years old, are enveloped in folds of fine linen cloth. Such are the oldest specimens of the art of spinning and weaving extant. But judging from the fineness and beauty of these fabrics, the art must have been practised long before such specimens were produced.

GENUS *Statice*. Sea Lavender. This is a large genus of ornamental plants. They are mostly evergreen shrubs, growing from a few inches to three feet in height. Many are natives of Russia and Siberia, and one or two herbaceous species are found in North America. In Europe they are cultivated as ornamental plants, but are still not very common.

ORDER VI.—POLYGYNIA. *Stamens 5. Styles many.*

This order, instead of containing six styles, or pistils,

To what class and order does common flax belong?

which would be its number, could we proceed numerically, as with the other orders, contains plants with an uncertain number of pistils, but always more than six. The name of the order signifies *many pistils*, in allusion to this circumstance.

This order contains only a few genera, and none of any considerable interest. The *Mysorus*, or Mouse-tail, is a little plant which belongs here. Its seeds are situated on a long slender receptacle, which stands erect, and in appearance very nearly resembles the tail of a mouse.

GENUS *Xanthorrhiza*, is compounded of two Greek words, and signifies *yellow root*, which is the common name of an inferior shrub whose place is here. This poor plant has jagged leaves, and bears some dull and purplish flowers. Like its associate, Mouse-tail, it is only mentioned here, for the want of a more respectable example.

Yellow Root is a native of our country, and grows about three feet high. It has no calyx, five petals, five nectaries, and five one-seeded capsules.

CLASS VI.—HEXANDRIA. *Stamens 6. Orders 6.*



The name *Hexandria*, is composed of two Greek words, and signifies *six stamens*. The flowers of this class are not cruciform. This class includes the most beautiful of the herbaceous plants which are cultivated in gardens, such as the Lily, Tuberose, Crown Imperial, Tulip, Hyacinth, &c. It also contains some of the most important esculent vegetables, and many medicinal plants. The Rice, Asparagus, Pine-Apple, and Plantain, are necessary articles of food, and the Colchicum, and Aloe, which also belong here, afford medicines of considerable power. Under the different orders we shall see, more particularly, what valuable and ornamental plants this class includes.

ORDER I.—MONOGYNIA. *Stamens 6. Style 1.*

This order embraces the Narcissus, the Plantain tree Pine-Apple, Tillandsia, Amaryllus, Bamboo, Fan Palm, Aloe, Lily, Tulip, Lily-of-the-Valley, Garlic, Star of Bethlehem.

How many styles does the order Polygynia contain? How many stamens constitute the class Hexandria? What ornamental genera does this class contain? What are among the useful and ornamental plants belonging to this class?

hem, Squill, Asparagus, Hyacinth, Solomon's Seal, and Crown Imperial. It contains most of the conspicuous plants of the class, and more than twice the number of all the other orders combined.

GENUS *Narcissus*. Name from the Greek, *narke*, signifying stupor, because some of the species of this tribe are poisonous. For this reason, Narcissus was dedicated to the Furies, who, by its means (it is said) stupefied their victims. This is a very large genus, and contains several beautiful, and favorite flowers. They are perennial plants, with bulbous roots. They grow from three to twelve inches high, and bear chiefly yellow and white flowers. The *Jonquil* is one of this genus, and the *Daffodil* another. The first is a very popular flower, and some of its varieties are remarkably beautiful, and very fragrant. The *Daffodil*, is well known as one of our earliest spring flowers. It is a native of England.

GENUS *Musa*. The Plantain Tree. The generic name, according to Linnæus, is from *Antonius Musa*, a Roman, and the freed man of Augustus. This splendid genus consists of species, which have perennial, roundish, solid, watery bulbs, with biennial, and sometimes longer enduring stems. The stems are round, thick, smooth, and simple, and from five to twenty-five feet in height. The leaves are oblong, and from three to ten feet in length, and nearly two feet wide. The flowers are generally white, and in large terminating racemes. The fruit of the common Plantain, (*Musa paradisiaca*), is borne in spikes, which sometimes weigh forty pounds each. It is at first green, but when fully ripe becomes pale yellow. Each fruit or piece of which the spikes or clusters are composed, is about eight or nine inches long, a little curved, and an inch or more in diameter. The *Banana tree*, (*Musa sapientium*), is a species of this genus, or perhaps only a variety of the common Plantain. There is little difference in the appearance of the tree, or taste of the fruit. These trees are natives of warm climates, and are considered by many who cultivate them, as among the greatest of earthly blessings. In a plantation of these trees, one or another of them will bear fruit most of the year. It is eaten boiled, roasted, fried, or dried, and preserved as a sweetmeat. Poor families are said to subsist

Whence does the name *Narcissus* come? What is said of the plantain and banana?

entirely on this fruit, with a little fish, or salt meat for seasoning.

GENUS *Bromelia*. Pine Apple. Linnæus named this genus after Olaus Bromel, a Swede, and the author of several works. This is one of the native productions of the New World. The Peruvians, among whom Europeans first found the Pine Apple, called it *Nanas*. The French, and other Europeans call it *Ananas*. It is called Pine Apple, because the whole fruit resembles the cones of the Pine tree. Of this genus there are about twenty species, and probably more than twice that number of varieties. The Pine Apple is an evergreen herbaceous plant, the different species of which grow from one to four feet high. It is chiefly cultivated in hot climates, as an article of commerce, but may be grown in a green house in any temperate country. Loudon says that this fruit is now cultivated very generally in Britain, and several places in Ireland, and at most of the capital cities on the continent. In the West Indies, and New Providence, this plant is propagated by the seeds, but in England this is chiefly done by suckers.

GENUS *Tillandsia*. The name of this genus was conferred by Linnæus, in honor of Elias Tillandsius, professor of physic at Abo. We have already described one species of this plant, as being valuable in the West Indies, on account of its leaves forming a vessel in the shape of a bottle, which holds a quantity of water. Another species, *T. usneoides*, has a stem no larger than a thread, and being a parasite, suspends itself from trees, where it hangs down a yard or more, like an old man's beard, by which name it is known in Jamaica. This curious plant grows in Louisiana, and I believe in Alabama also. From the southern states it is imported to this part of the country, for the purpose of stuffing saddles, coach cushions, chairs, &c., and is called *Moss*.

GENUS *Amaryllis*. This is the name of a nymph celebrated by the poets. It is a superb genus, containing from thirty to forty species. They are bulbous rooted, green house plants, which vary in height from three inches to three feet. Jacob's Lily, (*Amaryllis formosissima*), which is of a dark red color, with its petals gracefully curved, it is believed, is an American species. These plants are easily

What is the native country of the pine-apple? Why is this fruit called pine-apple? What are the uses of the *Tillandsia* genus? What is said of the genus *Amaryllis*? How is the name *Polyanthus* derived?

propagated by the shells, or scales taken from the bulbs and planted in a pot of mould.

GENUS *Polyanthus*. *Tuberosa*. From *polus*, many, and *anthos*, a flower, in allusion to the many flowers it bears. This is a tuberous rooted, ornamental, sweet scented flower, very generally cultivated in this country. It flowers in August, and September, and grows two or three feet high. It is easily propagated by its tubers.

GENUS *Bambusa*. *Bamboo Cane*. The Indian name is *bambos*, commonly called Bamboo. The common Bamboo, (*Bambusa arundinacea*,) has a woody, hollow, round, straight culm, forty feet high and upwards, with small, solid, alternate branches. It is a native of most tropical countries, and is said to grow in South Carolina. When describing the culm, we took notice of the many useful purposes for which the Bamboo is employed.

GENUS *Aloe*. The name is supposed to be of Arabic origin. The genus consists of a very large number of odd looking, thick leaved, succulent plants. The species are about one hundred in number, all evergreens, a part shrubs, and a part herbaceous plants. They vary in height from a few inches to ten or twelve feet. In our climate they are green house plants. Several species are cultivated in the West Indies, for the purpose of making the well known medicine, Aloes. The best kind of this gum-resin is called *Socotorine*, which name it takes from the island Socotra, in the streights of Babelmandel, where this article was formerly manufactured.

The whole genus came originally from Africa, but are now dispersed to most parts of the world. Most of the species consist of thick, rigid, radical leaves, crowded closely together at the base, gradually tapering upwards, and frequently armed with spines. From the centre of the leaves there rises a stem, which bears a spike of flowers as in the species *variegata*. Fig. 161. The gum-resin is prepared by cutting the leaves in pieces, and submitting them to pressure, after which, the juice thus obtained is evaporated to dryness in the sun.



GENUS *Lily*. Name, from the Celtic word *li*, which sig-

What is said of the genus *Aloe*? Of what class and order is this genus? What is the use of the *aloe*? What is the origin of the word *lily*?

nifies whiteness. The Lily has always been considered the emblem of whiteness. This is a splendid genus, all the species, of which are considered handsome flowers, and some of them rank among the greatest beauties of the garden. In scientific gardening, the Lilies are used as border ornaments, those of different colors being intermixed, or placed in fancy figures. The Lilies are natives of North America, of China, Siberia, and Germany. There are about twenty cultivated species, of which at least seven are natives of North America. The Lilies vary, from one, to six, or seven feet in height.

GENUS *Tulipa*. The Tulip appears to have been brought from Persia to Europe, by way of Constantinople, in 1559. In about a century after this time, all Europe became acquainted with this flower, in consequence of the high prices set upon certain species, and the rise of what has been called the *Tulipo-mania* of Holland and the Netherlands. At that time Tulip bulbs, the flowers of which were variegated, or as it is called, *broken*, in a certain manner, sold for immense prices, so that some speculators gave their farms, houses, and cattle, for one of these roots, thus leaving nothing between the absolute beggary of themselves and families, but a single Tulip bulb. Others bought and sold bulbs for \$2000, and upwards, and in one instance for \$10,000, in those days immense sums. These were sometimes florists, who bought roots at such prices, with an intention to propagate and sell the rare varieties at corresponding rates. But as the speculation was founded on an article, in its nature entirely worthless, it became a species of gambling, which the government interposed to suppress, by fixing the price over which no Tulip should be sold. This, however, was not done, until immense fortunes were made, and thousands reduced to poverty, by this singular speculation. (For an account of this *mania*, see Beckmann's Hist. Inventions, and Carr's Tour through Holland.)

The mode of producing variegated Tulips, consists in planting the seed, first in a rich soil, and afterwards transplanting the bulbs into one that is poor and sandy. Here, in the course of two or three years, the flowers generally become *broken*, or variegated of different colors. There is no method, as is generally supposed, of giving a certain

What are the native countries of the lily? What is the native country of the tulip? What is said of the tulipo-mania? How are variegated tulips produced?

succession of colors to any variety, nor can the florist be sure, even of changing the colors at all, since some varieties have been known to continue of the same color for more than twenty years, though constantly exposed to the same process by which others are broken in a year or two.

The varieties of this flower are numberless, and may be constantly increased. In a late London catalogue, there are advertised 30 kinds of double, and 600 varieties of single Tulips, all with their appropriate names, or descriptions annexed.

GENUS *Allium*. Garlic. Onion. *Allium* is said to be derived from the Celtic word *all*, which signifies hot, or burning. This is a large genus of strongly scented, bulbous rooted plants, all of them esculent, and some of them known in the days of Moses and Aaron. The number of known species are about ninety, of which our common Onion, (*Allium cepa*,) is the tallest, most valuable, and most extensively cultivated. The Shallot, (*Allium ascalonicum*,) grows eight or ten inches high, has a small bulb, seldom flowers, and is the mildest of all the cultivated species. This is eaten as a salad.

GENUS *Hyacinthus*. Hyacinth. Name, from the fabled Hyacinthus, who was said to have been killed by Apollo, and changed into this flower. This genus contains only two species, but a vast number of varieties have been produced by art and cultivation. It is a native of the East, and is said still to grow wild in abundance, about Bagdad and Aleppo. The Dutch, who first cultivated this bulb for sale, for many years made a considerable article of commerce of it. In about 1720, the florists of Haarlem, it was said, had 2000 varieties of the Hyacinth for sale. The fundamental varieties are double, semi-double, single, red, white, purple, blue, and yellow, in many different shades. These are known by different names, such as that of the florist who raised them, or his friends, or patrons, public characters, or some celebrated name of history, or antiquity, &c.

ORDER II.—DIGYNIA. Stamens 6. Styles 2.

GENUS *Oryza*. Rice. Oruza, the origin of this term, is a Greek word, said to be derived from the Arabic. Common Rice, (*Oryza sativa*,) is the only species belonging to

What is the origin of the name hyacinth? What is said of the varieties of the hyacinth?

the genus. Rice is an annual plant, having a culm from one to six feet in length, which is simple, erect, jointed, and round. The leaves embrace the stalk, and are reflected. The flowers and fruit are in a large terminating panicle. The varieties of Rice, as is the case with other cultivated grains, are as numerous as the soils, climates, and other circumstances under which it grows. It is cultivated in great abundance in most parts of India, and is the chief article of food for the native inhabitants. In China, two crops are said to be raised in the year, from the same ground. It is there sown chiefly on low ground, which is inundated at a certain season by a river. The mud thus deposited keeps the soil sufficiently rich to insure good crops from year to year. In Java, and some other eastern countries, what is called the *mountain Rice*, is grown upon the hills, where no water comes except the usual rains. In the southern states, and especially in the Carolinas, large quantities of this grain are raised for exportation, and in Europe this is considered by far superior to that from India, or any other country. This is the only genus of the least importance in this order.

ORDER III.—TRIGYNIA. *Stamens 6. Styles 3.*

Dock, (*Rumex*), and Meadow Saffron, (*Colchicum*), are the principal genera of this order.

GENUS *Colchicum*. Meadow Saffron. The name is derived from Colehis, where it is said this plant anciently grew in abundance. There are several species of this genus, but the only one of any consequence is the common Meadow Saffron, (*Colchicum autumnale*), which grows wild in the meadows of England, and other parts of Europe. It

Fig. 162 is a bulbous root, with a stem about four inches high, which bears a single purple flower, with five petals. See figure 162. Leaves linear, lanceolate, and radical. The bulb is about the size of that of a Tulip, and has from time out of mind, been considered as poisonous in large doses, but has been known and employed as a medicine ever since the days of Hippocrates. At the present day it is chiefly used in cases of rheumatism.

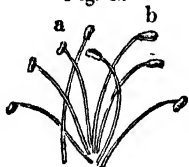
GENUS *Rumex*. Dock. This genus contains many spe-

What is said of rice as an article of food? What is said of the genus *colchicum*?

cies which differ greatly from each other in most respects. They grow from one to six or eight feet high. In most of the species the root is fusiform, but in some it is tuberous. The broad-leaved Dock, (*Rumex obtusifolius*,) is one of the most pernicious of weeds. It always prefers cultivated places, and the best soil in the neighborhood. Any rich neglected spot, which has once been occupied, is sure to be overrun with this plant. It is not a native of our country, but has been introduced from Europe, in every country of which, it is to be found. In this country this species grows from two to five feet high; leaves oblong-cordate, obtuse, the edges crenate. All the species of this genus produce large quantities of seed, by which new plants are propagated from year to year, and unless the young plants are destroyed the first year, by being pulled up by the roots, they shoot so deep as to make it difficult to do this afterwards. These roots are so tenacious of life, and so prolific, that when cut in pieces, they will not only grow again, but each piece will produce a new plant.

CLASS VII.—HEPTANDRIA. *Stamens 7. Orders 4.*

Fig. G.



This is a small class, and contains no genera of any considerable importance. The Horse Chestnut, the Calla, and the *Tricentalis*, are among the best known.

ORDER I.—MONOGYNIA. *Stamens 7. Style 1.*

GENUS *Æsculus*. Horse Chestnut. *Esculus*, was the name of a tree which furnished the Latins with an *esculent*, or eatable nut. It is called Horse Chestnut, (*Hippocastanum*,) because this nut was formerly employed as a medicine for horses. There are several species of this genus, of which the *Æsculus hippocastanum*, or common Horse Chestnut, is the largest, and most beautiful. This tree came originally from the northern parts of Asia, and has migrated to this country by the way of Constantinople, Vienna, Italy,

What is the botanical name of dock? Is the dock a native of America or not? What is the origin of the name horse chestnut?

France and England. The Horse Chestnut is magnificent from its size, and form, and when in blossom, few trees can compare with it in beauty. The contrast between its spikes of delicate white and pink flowers, and the deep green of its noble digitated leaves, produces a charming effect. Considering the rapidity of its growth and cleanliness, perhaps there are few trees better adapted to avenue and street ornament than this. The nuts, or capsules, are large and mahogany colored, and form a fine looking fruit. But its taste is astringent and disagreeable, being obviously not formed for the food of man. It is said, however, that deer eat them with avidity, and that in Turkey they are ground, and mixed with provender for the food of horses.

GENUS *Trientalis*. Name, from the Latin, *triens*, the third of a thing; but why so named no one seems to know. *Trientalis Americana*, has oblong lanceolate leaves, which grow in a whorl at the top of the stem. The plant is about six inches high, and above the whorl of leaves ascends a filiform peduncle, bearing a delicate white flower, consisting of seven ovate acuminate petals. The divisions of the calyx, the number of petals in the flower, and the number of leaves in the whorl, are each most commonly seven. It is common in damp woods, among Pine trees, and flowers in May, and June.

ORDER II.—DIGYNIA. *Stamens 7. Styles 2.*

This order contains only one genus, *Limeum*, a poisonous African plant.

ORDER III.—TETRAGYNIA. *Stamens 7, Styles 3.*

This order contains two or three genera only, and these of no use or interest.

ORDER IV.—HEPTAGYNIA. *Stamens 7. Styles 7.*

GENUS *Septas*. Name, from *septem*, seven, by which number it is well characterized. It is a little plant from the Cape of Good Hope, with umbels of white flowers, each flower having its calyx in seven segments, with seven petals, seven germens, and consequently seven capsules.

What is said of the horse chestnut as an ornamental tree?

CLASS VIII.—OCTANDRIA. *Stamens 8. Orders*

Fig. H.



The word *Octandria* signifies eight stamens. This is not a large class, but it contains several important plants, both to the gardener and botanist. The *Jeffersonia*, whose lid opens like a snuff box, and *Heath*, *Whortleberry*, *Daphne*, and *Nasturtium* genera belong here.

ORDER I.—MONOGYNIA. *Stamens 8. Style 1.*

GENUS *Tropæolum*. *Nasturtium*. Name from *tropæum*, a trophy, because the leaf resembles a shield, and the flower a golden helmet, sometimes stained with blood, these warlike instruments being carried at the celebration of ancient trophies. The *Nasturtium* is a well known climbing plant, the seeds of which are pickled, and used as substitutes for capers, to which by many they are preferred. In the evening the flowers of this plant emit, spontaneously, at intervals, sparks of visible light, like the faint flashes from an electrical machine. The daughter of Linnæus first observed this curious fact.

Fig. 164.



GENUS *Erica*, Fig. 164. *Heath*. Name, from *eriko*, to break, because the branches of these plants are very brittle. This is a vast genus, of which *Loudon's Encyclopedia of Plants* contains the description of about 400 species, several of which abound in the waste lands of every part of Europe. But not a single species of *Heath* has ever been discovered in the New World. The greatest number of species grow to the height of about two feet; several rise no higher than six or eight inches, and a single species, called the *lofty*, grows six feet high. In nearly all the species, the stems and branches are closely beset with fine leaves, as in the species *physodes*,

Fig. 164; the sepals are four, and the corollas are four-cleft. The flowers of a majority of the species are white, or red; many, however, are pink, purple, &c. The corollas are mostly of the ovate or bell shaped form, and hang

What is said of the extent of the class Octandria? What genera are mentioned as belonging here? What is the origin of the name *Tropæolum*? What is said of the number of species belonging to the genus *Erica*?

pendulous like those of the Whortleberry genus, which they often nearly resemble in appearance. They are persistent, that is, they remain some time without falling off, or withering. All the species are evergreen shrubs. Only three or four species are natives of Great Britain, but these are quite common in all the northern parts of that country, and are employed by the poorer classes, for various useful purposes. The walls of their cabins are constructed of alternate layers of Heath and earth, and their roofs are covered with a thatch of this plant instead of straw. The hardy Highlanders frequently make their beds of it, and in the Western Isles, they make a yellow dye for their yarn, of the same. It is said also, that in some of the Isles, the people tan their leather with a decoction of this plant, and in many parts of Great Britain besoms are made of it. With the exception of these three or four native species, all the Heaths now cultivated in Great Britain, and America, amounting to nearly 400 kinds, were originally imported from the Cape of Good Hope, and are green house plants. They were sent from the Cape to England, from time to time, but all during the reign of George III. The only soil in which this plant grows well, is peat. If any substitute has been found, it is leaf mould, or the decayed leaves of trees from the woods, dried and sifted, and then mixed with fine sand. The Heath is becoming a fashionable hot house ornament in this country, but is often spoiled for want of attention to the soil in which it grows.

GENUS *Jeffersonia*. Twin-Leaf. The generic name is in honor of the late president Jefferson. It is a small plant, growing about six inches high, with five colored sepals, and eight petals. The leaves are in pairs. It is remarkable, chiefly for the peculiar manner in which its capsules open, being similar to that of a snuff box.

GENUS *Daphne*. This is the Greek name for the Laurel. This genus, of which there are a considerable number of species, consists chiefly of diminutive evergreen shrubs, several of them of great beauty, and bearing highly fragrant flowers. Linnæus remarks that the terminating buds of this genus produce leaves, and the lateral ones flowers, hence the shoots ought not to be pruned. The Mezereon is a species of this genus. It is remarkably hot and acrid,

What is said of the uses of the heath in the Highlands of Scotland? From what country have the heaths been chiefly derived? Whence does the genus *Jeffersonia* derive its name? What is said of the genus *Daphne*?

especially the root, and has long been a popular remedy for the toothache. The plant grows about four feet high, bears sessile pink flowers, and lanceolate leaves. The bark is employed by the French surgeons as an escharotic, to produce what is equivalent to a perpetual blister. It is a native of most parts of Europe, but it is believed not of North America.

ORDER II.—DIGYNIA. *Stamens 8. Styles 2.*

This order contains nothing worthy of notice.

ORDER III.—TRIGYNIA. *Stamens 8. Styles 3.*

This order contains the genus *polygonum*, which consists chiefly of common weeds. Several of the species are frequent in our gardens, and are known under the names of *Knot Grass*, *Scratch Grass*, *Water Pepper*, &c.

ORDER IV.—TETRAGYNIA. *Stamens 8. Styles 4.*

This order is also barren of any interesting plants.

CLASS IX.—ENNEANDRIA. *Stamens 9. Orders 3.*

Fig. 1.



The name of this class comes from *ennea*, nine, and *aner*, a stamen, and signifies nine stamens. This is one of the smallest classes in the whole Linnæan System, there being only a few plants having nine stamens, and no more. It however contains three valuable genera, the Cinnamon tree, the Rhubarb, and Cashew-nut.

ORDER I.—MONOGYNIA. *Stamens 9. Style 1.*

GENUS *Laurus*. Cinnamon. The name *Laurus* is derived from the Celtic, and signifies green, in reference to the perennial color of the genus. This genus contains some of the most celebrated and important among the fragrant and spice bearing trees, as the Camphor tree, Cinnamon tree, and some others. The species are chiefly trees of large size, some of them, as the Sassafras, Cassia, and others, growing to the height of from 60 to 80 feet. Some, however, are only shrubs, growing no higher than five or six feet. All the species, except the Sassafras of this country, are evergreen plants.

What does the name of the 9th class signify? What is said of the extent of the class Enneandria, and the number of valuable plants it contains? What is said of the genus *Laurus*?

Fig. 166.



The Cinnamon tree, (*Laurus cinnamomum*,) grows 20 feet high, has a smooth, ash-colored bark, with ovate lanceolate, reticulated leaves. The flowers are small and make no show. (See the figure, which represents only a branch.) The fruit is about the size of an olive, or small filbert, soft, insipid, and of a deep blue, resembling in color some kinds of plum. This pericarp incloses a nut, the kernel of which germinates soon after it falls, and therefore cannot easily be transported to a distance. The inner bark of this tree forms the well known spice called

Cinnamon. This tree is a native of Ceylon, Malabar, Sumatra, and other Eastern, warm climates. The barking commences in May, and continues until October. For this purpose branches of three years old are cut off, and longitudinal incisions are made on each side of the shoot, so that the bark can be loosened and taken off entire. These strips are then laid in bundles, and allowed to ferment, until the outer and inner layers can be separated. The inner bark, which forms the Cinnamon, is next allowed to dry, by which it contracts, and takes the quilled form, after which the smaller pieces are put within the larger ones, and the whole being tied in bundles, is ready for sale.

The Camphor tree, (*Laurus camphora*,) is very nearly allied to the Cinnamon tree, the appearance of the two denoting that they belong to the same family. The roots, leaves, and wood of this tree, when rubbed, or heated, emit a strong odor of camphor, every part of the tree also tastes of that peculiar substance. The mode of obtaining the camphor is quite simple. The roots, and smaller branches, being chopped into small pieces, are placed in a net, and suspended in a retort, or iron pot, with some water at the bottom. To the retort is fitted a head, or capital, with a spout resembling that of a still. The head contains a quantity of straw. On the application of heat to the bottom of the retort, the steam of the water penetrating the contents of the net, extracts the camphor, which, rising with the steam, is deposited on the straw, while the condensed wa-

What is the mode of gathering and curing the cinnamon bark? What is the mode of obtaining camphor?

ter passes off at the spout. It is afterwards purified, by sublimation in a close vessel.

GENUS *Anacardium*. Cashew-nut. The name of the genus is compounded of the Greek, *ana*, (in composition,) like, and *kardia*, the heart, in allusion to the form of the nut. This is a small, but elegant tree, bearing corymbs of sweet



Fig. 167.

smelling flowers. The fruit is red, or yellow, and shaped like a pear. Fig. 167. Its taste is a little acid, and astringent, but very agreeable. The juice being expressed and fermented, makes an agreeable wine, and when distilled a spirit is drawn from it which is highly esteemed among the lovers of strong drink. The nut, which is the part of the fruit best known abroad, and from which the species takes its name, is a singular and odd looking appendage to

the pome. It is appended to, or perhaps protrudes from the base of the fruit, as represented by the figure. The shape is rather that of a kidney than a heart. The shell which encloses the kernel contains a thick inflammable oil, which is extremely caustic, as those who have cracked these nuts with their teeth have often found. This oil, when extracted, is a remedy for corns, ringworms, &c. The kernel, when fresh, is perfectly wholesome, and has a most delicious taste. This tree grows in hot climates, as India, and the West Indies.

ORDER III.—TRIGYNIA. *Stamens 9. Styles 3.*

(There are no plants with 9 stamens and 2 pistils, and therefore the second order is here omitted.)

GENUS *Rheum*. Rhubarb. *Rheum* comes from *Rha*, the ancient name of the river Volga, on the banks of which, this plant appears to have been first discovered. It is the only genus of this order. Common Rhubarb, (*Rheum rha-ponticum*,) is extensively cultivated in gardens, for the sake of its petioles, which are used in making pies and tarts. When the leaves are full grown, one half of them may be cut off at a time, taking the foot stalk near the ground.

In what manner does the cashew-nut grow? Why is the 2d order of this class omitted? How does the genus *Rheum* derive its name? What are the uses of rhubarb?

The leaves, proper, are next cut off and thrown away, and the petioles stripped of their external fibrous coverings. The fleshy part, which remains, is then cut into short pieces, well seasoned, and made into pies, or tarts; and there are few who having tasted them will desire better. It is common to let the plants grow in the open air, but they may be brought forward earlier, as well as greatly improved in quantity and taste, by the following method. As early as possible in the spring, place a barrel, or half barrel, over the plant, and surround this with manure, in a state of fermentation. By this means, the plant will not only be hastened in its growth, by the warmth of the manure, but will also be blanched, and made more delicate in appearance and taste. A part of the head of the barrel must be in a state to be removed, so that the plant can be examined, and its leaves cut off when fit for use. It is also necessary that a small aperture should be left at all times for the benefit of the air. The *Rheum palmatum*, is the species which is so valuable as a medicine. It is said that any of the species may be cultivated for the table.

ORDER IV.—TETRAGYNIA. *Stamens 9. Styles 4.*

This order contains an aquatic plant common in England, called Flowering Rush, (*Butomus umbellatus*,) which is an ornament to pools and rivers.

CLASS X.—DECANDRIA. *Stamens 10. Orders 5.*

Fig. K.



The name of this class is from the Greek, *deka*, ten, and *aner*, a stamen, and signifies ten stamens. This is the last of the Linnæan classes in which the stamens are distinct, and bear any determinate relation to the other parts of the flower. The stamens in this class must not only be ten, but they must also be separate and distinct. The *papilionaceous* flowers belong to class 17th, Diadelphia, only when their styles are united. When, therefore, the flower has ten stamens, all distinct, and separate, it belongs to the present class, but if they are united at the base, into two sets, having the butterfly-shaped corolla, it is a Diadelphous plant.

What does the name of the class Decandria signify? How are the plants of this class distinguished from those of the class Diadelphia? What is said of the extent of the 10th class?

Decandria is a class of considerable extent, and contains portions of several natural orders, of which the most important is the *Leguminosæ*, or plants bearing pods without a longitudinal partition, as the Cassia, Bean, and Pea. Most of the plants of this description, which fall within this class, are natives of the Cape of Good Hope, or New Holland; and many of them are highly ornamental. This class also includes the trees which produce Logwood, and Mahogany, articles of great importance in the arts and ornaments of life. The beautiful genera, Kalmia, Rhododendron, and Andromeda, likewise belong here, as does the Dianthus, of which the Carnation is a species.

ORDER I.—MONOGYNIA. *Stamens 10. Style 1.*

GENUS Cassia. This genus contains at least sixty species, none of which, however, except the Senna, (*Cassia orientalis*,) are of any considerable consequence. Of this genus we have four or five species, growing wild in New England.

GENUS Swetenia. Fig. 169. Mahogany tree. This genus was named after Von Sweiten, who persuaded Maria Teresa, Empress of Germany, to found the botanic garden of Vienna. The Mahogany tree, (*Swetenia mahogani*,) is a tree of the first magnitude, growing from 80 to 100 feet high. The trunk is sometimes very large, being near the ground four or five feet in diameter. The branches are numerous and spreading.

Fig. 169.



Leaves pinnate, in four pairs, as in the figure; the leaflets oblong ovate flowers in panicles. Mahogany is preferred to all other woods for certain kinds of cabinet work, not only on account of its beauty, but because it is not liable to shrink and swell with the variations of moisture and dryness, like most other woods. It grows in the hottest parts of America, as Cuba, Hispaniola, and the Bahama Isles. The tree is said to grow on rocks, where there is little nourishment and a dry soil, and to come from the bay of Honduras.

What important tribes and genera are mentioned as belonging to this class? In what respect is *swetenia* an important genus? Why is mahogany preferred to all other kinds of wood for cabinet furniture?

GENUS Quassia. It was so named by Linnæus, in memory of Quassi, a negro slave of Surinam, who had employed it in curing a malignant fever which raged there. Bitter Quassia, (*Quassia amara*.) is well known as the purest of all tonic bitters, and is universally employed in medicine. The Quassia tree is lofty, and strongly branched, with bark and leaves resembling those of common Ash. The flowers are in terminal racemes, and of a bright red color. All parts of the tree, and root, are intensely bitter. It is a native of the hottest parts of America.

Fig. 170.



GENUS Dionea. Fig. 170. Venus' Fly-trap, (*Dionea muscipula*.) is a singular plant, having leaves which catch and retain flies, and other insects, and hence its trivial name. The plant consists of a single stalk, rising from the midst of radical leaves, about eight inches high, and terminated by a corymb of white flowers. The leaves have winged petioles, like those of the Seville Orange. The extreme part of the leaf proper, which is nearly in the form of two oblong circles, is the part that operates as the trap. See the figure. These parts, or lobes, collapse, or fold themselves together, when they are irritated or touched. Hence, when an insect crawls between the lobes, it is entrapped, and detained. Linnæus says, that when the insect ceases to struggle, the leaf opens and lets it escape. But Ellis says, the leaf never opens so long as the insect remains there. A sweet liquor which the leaf secretes, tempts the insect to its destruction. This plant is a native of Carolina, and is cultivated in the green houses of our climate.

GENUS Kalmia. Laurel. Calico bush. The generic name is in honor of Peter Kalm, professor at Abo, in Sweden, and author of Travels in North America. The species are well known and very beautiful evergreen shrubs, which, says Loudon, deserve a place in every American ground. The common Laurel, (*Kalmia latifolia*.) called also Ivy, is a native of most parts of New England, though found only in particular places, chiefly among rocks, and on barren

How did the genus Quassia obtain its name? What is the peculiarity of the *dionea muscipula*? How did the genus Kalmia obtain its name? What are the common names of this genus?

soils. It grows eight or ten feet high; leaves ovate elliptical, and leathery; flowers pale red, or sometimes nearly white, and in dense terminal corymbs. When in flower, it is among our gayest native shrubs. The leaves are undoubtedly poisonous. A few drops of the tincture poured on a rattlesnake, (*crotalus horridus*,) is said to have killed the reptile in a short time.

GENUS *Rhododendron*. Name, from the Greek, *rhodon*, a rose, and *dendron*, a tree, because the flowers resemble, in color, bunches of roses. The species are superb evergreen shrubs.

There is a considerable number of species, and several varieties of this plant, four of which are natives of North America. The Rosebay Laurel, (*Rhododendron maximum*,) a native of the middle and northern states, rises to the height of twenty feet, and is not surpassed in elegance or beauty by any American shrub. The leaves are large, oblong, smooth, leathery, and of a deep green; flowers in pink colored terminal umbels, which are large and compact. It may be propagated by the seeds, or roots.

ORDER II.—DIGYNIA. Stamens 10. Styles 2.

GENUS *Hydrangea*. Name, from *odor*, water, and *aggeion*, a vessel. The garden species, from which the genus appears to have been named, is a marsh plant, and thrives best where there is much water. London says, that a large plant, in summer, will consume ten or twelve gallons of water per day. The Changeable Hydrangea, (*H. Hortensis*,) is much admired on account of its profusion of pink flowers, and is a common shrub in our gardens. The flowers, like those of the Snowball, are monsters, producing no seed. It is said that this plant will produce blue flowers by watering the young plant the year before, with alum water.

This plant has not been found by any botanist in its wild state, but is extensively cultivated in the gardens of China, and Japan, from whence it was introduced into England, by Sir Joseph Banks, in 1788.

GENUS *Dianthus*. Pink. Name, from the Greek, *Dios*, and *anthos*, divine flower, so named on account of its pre-eminent beauty and fragrance. Of this beautiful genus there are about fifty species, most of which are cultivated,

What does the word *rhododendron* signify? What is said of the genus *hydrangea*? Whence does the *dianthus* derive its name?

and many of them are favorite flowers in nearly all parts of the world. The creative hand has indeed bestowed on this genus, in a remarkable degree, those qualities which make its species generally admired by man. The beauty of form and color, and the perfect gratefulness of its fragrance, together with the ease with which it is cultivated, will always give the Carnation a place among the most favored products of the vegetable kingdom. All the species of this genus are evergreen herbaceous plants. They vary in height from that of the small flowered Pink, which is only six inches high, to that of the Tree-Carnation, which is three feet and upwards. One or more of the species are natives of nearly every country in Europe, and one is from China, one from Africa, and one from North America. Of the Carnation, which is considered the finest species, there were 400 named varieties, which were cultivated more than a century ago, and this number is said not to have diminished since that time. The variegated colors, whatever they may be, are most esteemed, when they are perfectly distinct, that is, not blended or shaded with each other. Their disposition is also a matter of consequence among amateurs and florists. They should be in regular stripes, broadest at the edge of the lamina, or widest part of the petal, and gradually becoming narrower, as they approach the claw, or base of the petal, and there terminating in a fine point. Each petal should also have a due proportion of white, that is, one half, or nearly so, and this should be perfectly clear and free from spots. By such marks do florists judge of the beauty and value of these flowers.

ORDER III.—TRIGYNIA.—*Stamens* 10. *Styles* 3.

To this order belong the genera *Arenaria*, (*Sandwort*), *Stellaria*, (*Chickweed*), *Silène*, (*Catchfly*), and *Cucubalus*, (*Campion*), none of them plants of any considerable beauty or value. The Chickweed is a most vexatious little creeping plant, especially in rich gardens. It grows under the snow, and flowers most of the year, and when established, I believe no human means can eradicate it.

ORDER IV.—PENTAGYNIA. *Stamens* 10. *Styles* 5.

GENUS *Oxalis*. Sorrel. This is a tribe of small, most-

What is said of the qualities and beauties of the genus *Dianthus*?

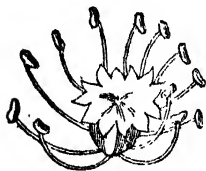
ly bulbous rooted plants, which are without their leaves about one half the year. It is a large genus, the known species which grow in Great Britain alone, amounting to ninety-six. Some of them have scapes, and others have proper stems, and they nearly all are acid to the taste. The juice of common Sorrel, (*Oxalis acetosella*,) being expressed and evaporated, yields crystals of oxalic acid, which in solution is employed to remove stains from linen. Several of them are pretty ornamental flowers.

ORDER V.—DECAGYNIA. *Stamens* 10. *Styles* 10.

GENUS *Phytolacca*. Name, from the Greek, *phuton*, a plant, and the Latin, *lacca*, lac; that is to say, a plant whose fruit gives a red color, like lac. There are several species of this genus, one of which is common in this country, and is known by the trivial name of Poke, or Cocum. It is the *Phytolacca Decandria* of botanists. Loudon says, that the name Poke, is a corruption of Pocan, the name by which this plant was known in Virginia. The Poke is a very conspicuous plant by road sides, and waste grounds, growing six or eight feet high, with purple stems and large ovate leaves. Flowers in long white racemes, succeeded by flat red berries. The juice of these berries stains a deep purple, and is often used by children to paint their faces. In the fall of the year, the robins and other birds take great delight in eating this fruit.

CLASS XI.—DODECANDRIA. *Stamens* 12. *Orders* 6.

Fig. L.



This, remarks Mr. Loudon, "is a small incongruous class, containing no extensive genus of importance, except *Euphorbia*. Some botanists have been of opinion that it ought to be cancelled, but it is probable that Linnæus understood the application of his own principles, as well as some of his more pretending followers, and it is certain that if the Linnæan plan can be made to act successfully, its artificial arrangement must be rigorously observed."

Its name is from the Greek, *dodeka*, twelve, and *aner*, a stamen, and therefore signifies twelve stamens. But it will

What is said of the genus *Oxalis*?

be found in practice, that many plants, whose flowers, in other respects, agree with the description of this class better than with any other, have from 12 to 19 stamens. It will be remembered, that the stamens of this class must be separate, and not united by their filaments into one or two sets.

ORDER I.—MONOGYNIA. *Stamens 12. Style 1.*

No plants of consequence belong here.

ORDER II.—DIGYNIA. *Stamens 12. Styles 2.*

GENUS *Agrimonia*. Agrimony. Common Agrimony (*Agrimonia eupatoria*,) rises to the height of two or three feet. Leaves interruptedly pinnate, leaflets oblong ovate, and serrate. Spikes of flowers elevated, the flowers scattered, and yellow. It is a common plant about fences, and road sides, and was formerly used as a tonic in medicine.

ORDER III.—TRIGYNIA. *Stamens 12. Styles 3.*

GENUS *Reseda*. Name, from the Latin, *resedo*, to calm, or appease, because it was formerly thought a remedy for the pain of a bruise, or wound. This plant is a native of various parts of Europe. The species *Luteola* is called

Fig 172. *Dyer's weed*, because it affords a most useful yellow color, and is much employed, especially in France, as a coloring plant.



The yellow color of the paint called *Dutch pink*, is obtained from this plant. This *Reseda* grows about two feet high, and produces a long spike of flowers, without petals. Fig. 172. *Reseda odora*, which is well known under the name *Mignonette*, is a species of this genus. In London this is said to be among the most fashionable odoriferous plants, and to be in great demand for rooms, balconies, &c. It therefore forms an extensive article of culture among florists, and market gardeners in the vicinity of that city. The plants

for this purpose are transferred to pots, each pot of four inches in diameter containing four plants. To obtain plants

How many stamens has the class Dodecandria? In this class are the filaments separate, or united? What is the botanical name of mignonette?

for blowing, from December to February, the seeds, should be sown in July, and the plants potted in September.

The inflorescence of this genus is very peculiar, and has afforded disputes among botanists, as to its nature. On this subject, Dr. Lindley says, "The usual idea of the flower of *Reseda* has been, that it is furnished with a calyx of a variable number of divisions, with as many petals, producing from their surface certain anomalous appendages, and with an ovary, (germen,) and stamens inserted on a great fleshy body, called nectary by Linnæan botanists, and squama by others." Dr. Lindley is however of the opinion, that a much more natural mode of understanding this genus is to consider it as having compound flowers; taking the calyx of authors for an involucre, their petals for neutral florets, and their nectary for the calyx of a fertile floret in the middle. The curious botanist will find this subject fully discussed in Lindley's Nat. System.

GENUS *Euphorbia*. Spurge. Name, from Euphorbus, physician to Juba, king of Mauritania, who first used this plant in medicine. This is a vast tribe, the natural order containing, according to Dr. Lindley, 1500 species. Some of them are exceedingly grotesque, and curious looking plants, while others are common weeds, some of which are poisonous. They are all latescent, or milky, and most of them herbaceous, though a few are shrubs. Some are upright, while others are creepers, and a few are entirely without leaves. Several species very nearly resemble the Cactus, or Prickly Pear tribe, being composed almost entirely of a fleshy, deformed stem. The milk, or juice of most species, is said to be so acrid as to corrode the flesh,

Fig. 173. and produce ulcers wherever it is applied. The



Official Spurge, (*Euphorbia officinarum*,) Fig. 173, is the species from which the Euphorbium used in medicine is obtained. This plant, a native of Africa, grows at the foot of Mount Atlas, where the inhabitants gather the gum-resin in question, by making incisions in the plant. The milky juice flowing out, concretes into the form of oblong tears, which are afterwards gathered and put up for sale. At the present day this is rarely employed as an internal remedy, its action

What is said concerning the inflorescence of mignonette? What is the origin of the name of the genus *Euphorbia*? How extensive is the genus *Euphorbia*?

Fig. 174.



being considered too violent. *Ipecacuanha*, (*Euphorbia ipecacuanha*.) Fig. 174, is the plant, the root of which affords the American Ipecac, a well known emetic. Some of the species of this singular genus, are found in nearly every country and island on earth, but most of them, (Dr. Lindley thinks three eights) belong to the equatorial regions of America.

ORDER IV.—TETRAGYNIA. *Stamens* 12. *Styles* 4.

This order contains nothing worthy of notice.

ORDER V.—PENTAGYNIA. *Stamens* 12. *Styles* 5.

This order is also barren of interesting species.

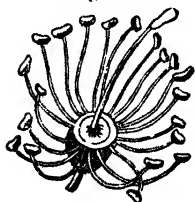
ORDER VI.—DODECAGYNIA. *Stamens* 12. *Styles* 12.

The name of this order comes from *dodeka*, and *gyne*, and signifies 12 styles, or pistils.

GENUS *Sempervivum*. Houseleek. Generic name, from the Latin, *semper vivere*, to live for ever, in allusion to the tenacity of life common to the species. This is a large genus of odd looking succulent plants, of singular habits. Some of them are used as ornaments, or curiosities, because they live and grow without roots. The common Houseleek, (*S. tectorum*.) is said to cover the entire roofs of the houses in Sinoland. The tree Houseleek, (*S. arboreum*) grows eight or ten feet high, has a yellow flower, and is a fine evergreen shrub.

CLASS XII.—ICOSANDRIA. *Stamens* many, *perigynous*. *Orders* 3.

Fig. M.



The name of this class comes from *eikosi*, twenty, and *aner*, a stamen, and therefore signifies twenty stamens. But the class includes all such plants as have twenty, or more distinct stamens, which are perigynous, that is, inserted into the calyx, not growing on the receptacle. The calyx is always monosepalous, or consists of sepals united at the base. This class is not large, but is exceed-

What useful plants belong to the genus *Euphorbia*? How many stamens have plants belonging to the class Icosandria? How are the stamens situated?

ingly important to man, as containing many of the most delicious and widely diffused fruits of the earth. Among these are the Apple, Pear, Cherry, Prune, and Plum. It also contains the Rose tribe, which for variety, beauty, and fragrance, is the prince of flowers. The genera of this class are most of them extremely natural, there being a likeness in appearance, habits, or qualities, in most of the species belonging to each. These have likewise been studied with unusual attention, owing to their domestic importance, and the great length of time most of them have been cultivated. This latter circumstance has, however, made some of the species exceedingly perplexing in their botanical relations, owing to the great changes they have undergone by cultivation. The pupil will, therefore, much more frequently find himself at a loss concerning the botanical characters of plants which he has known from his infancy, than with respect to many which he has seen for the first time. The class contains three orders.

ORDER I.—MONOGYNIA. *Stamens many, perigynous. Style 1.*

GENUS Cactus. This name was used by Theophrastus, to signify an unknown, spiny plant, which was edible. The Cactus tribe presents a large number of grotesque, or curious looking succulent plants, generally without leaves, and having thick jointed stems. For the most part they are armed with spines, with which bristles are often intermixed. This tribe is called *Indian Fig*, and one or two species are known under the name of Prickly Pear. A majority of the genus are natives of South-America, but are now common in the West-Indies. Most of them are green-house plants in our climate, though the Prickly Pear, (*Cactus opuntia*,) is common along the Hudson river, and is found in every part of the United States south of New-York.—See *Torrey's Flora*. The celebrated flower called Night blooming Cereus, (*Cactus grandiflorus*,) belongs to this genus. This has a creeping, jointed, five angled stem, which sometimes grows several yards in length in our hot houses. The flowers proceed from the sides of the stem, and are exceedingly large, splendid and sweet scented, but of short duration. These flowers begin to open at seven or eight o'clock

What are among the most important plants belonging to this class? Why are the botanical relations of domestic plants, more difficult than those of wild ones? What is the botanical name of the night blooming cereus, and to what genus does it belong?

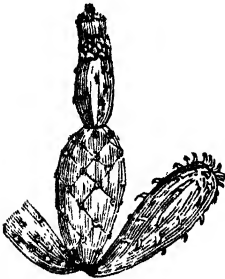
in the evening, are full blown by eleven, and at four or five o'clock the next morning, they droop, and are quite withered. There is hardly a more magnificent flower than this, even when seen by candle light, and it is probable that its splendor would be increased, could it be seen by the light of day. Its calyx, when open, is nearly a foot in diameter, the inside



176.

of which being of a splendid yellow color, appears like the rays of a star, the petals which do not reach the outer circumference of the calyx, are pure white; while the vast number of recurved stamens which surround the pistil in the centre, add greatly to the beauty of the whole. The shape of this flower is represented by Fig. 176.

Fig. 177.



The species on which the Cochineal insect chiefly feeds is called Cochineal Fig, Fig. 177, (*Cactus cochinillifer*,) and is without spines, or thorns. The insect also feeds on other species of the Cactus tribe, but this only is cultivated as its food, because it is the least annoying by its prickles. It grows four or five feet high, and appears like a number of thick succulent leaves, joined to each other. It resembles the com-

mon Prickly Pear, denuded of its arms. This, as well as the Prickly Pear, produce in their native climate an edible fruit, which is highly esteemed. "On the top of this fruit there grows a red flower; this, when the fruit is ripe, falls down on the top of it, and covers it, so that no rain or dew can wet the inside. A day or two after, the flower being scorched up by the heat of the sun, the fruit opens wide, and the inside appears full of small red insects, (probably attracted by the fruit.) The Indians, when they perceive the fruit open, spread a large linen cloth, and then with sticks shake the plant to disturb the insects, so that they may take wing to be gone, but [they] keep hovering over the plant, till by the heat they fall down dead on the cloth,

What species of cactus is cultivated as food for the cochineal insect?

where the Indians let them remain two or three days till they are dry." *Ency. Plants*, p. 414. The Cochineal insect is cultivated in Mexico and Spain, and forms one of the most durable and rich of all purple dyes.

GENUS *Caryophyllus*. Clove tree. The Greeks derived the name of this genus from an Arabic word, which signified the same plant that we call *Clove tree*. The name *Clove* signifies *nail*, from the resemblance of the fruit to a nail. The Clove tree, (*Caryophyllus aromaticus*), which is the only species of its genus, is a native of the East, probably of Arabia, where it has been known from the highest antiquity. It grows to the height of twenty feet, bears a white funnel-shaped flower, which produces a two celled capsule containing the well known hot aromatic fruit. The leaves are lanceolate, and the tree branched. See Fig. 178.



GENUS *Myrtus*. Myrtle. From the Greek *murtos*, by which name this plant was known. This is a well known genus of evergreen shrubs, one species of which was sacred to Venus. It was a favorite among the ancients, and at Athens was the symbol of civic authority. Several of the species are remarkably beautiful, having broad, ovate, shining, deep green leaves, contrasted with racemes of white flowers. Some of the species rise into trees 30 feet high.

GENUS *Amygdalus*. Almond. Peach. This genus contains the common Peach, (*Amygdalus Persica*;) the Nectarine, which is considered only a variety of the Peach; the sweet and bitter Almond, and several other species, less known and esteemed.

GENUS *Prunus*. Plum and Cherry. This genus includes a considerable number of species, some of which differ very materially from the others. Not only the Plum and Cherry, with their species and numerous varieties, but also the Apricot belong here. The common Cherry, (*Prunus cerasus*;) which we call English Cherry, affords as many as forty varieties. The species and varieties of Plum,

What is the use of the cochineal insect? What is the form and size of the clove tree, and in what manner are the cloves produced? What is said of the myrtle? What is the botanical name of our common peach? What is said of the genus *Prunus*? •

which are cultivated in our gardens, are also quite numerous. The common Apricot, (*Prunus armeniaca*), is commonly supposed to have been a native of Armenia. It is, however, found in its native, or wild state, and in great abundance, on Mount Caucasus, on the mountains West of Pekin, and on the Island of Japan. There are fifteen or twenty excellent varieties of this fruit. These trees do well when budded on Plum stocks, which indeed is the common method of raising this fruit.

ORDER II.—DI-PENTAGYNIA. *Stamens many, perigynous.*
Styles 2 to 5.

The compound name of this order is from the Greek, and signifies *two-five styles*. Any flower, therefore, having twenty or more perigynous stamens, and two, three, four, or five styles, belongs to this class and order.

GENUS *Pyrus*. Apple. Pear. The generic name is said to come from the Celtic, *perea*, from which the Latins derived their word *pyrus*. Our name, *Apple*, comes from the Greek, *apios*. The genus *Pyrus* is characterized by a calyx, five cleft, superior; corolla five petalled; stamens many; styles five; pome, five celled, and many seeded. There are few genera of fruits which are so changed by cultivation, or which so richly reward the care of the gardener as this. The truth is, that the best kinds, save the trouble of engrafting, are much more easily grown in quantity, than the poorest, because the trees are much more productive. The species of Apples and Pears are not very numerous, but the varieties of each are innumerable. Of the Pear, the Romans are said to have had thirty-six varieties only. Probably our method of producing new varieties was then unknown. We have stated in another place, that the seeds of this genus, from the same tree, or even from the same fruit, when planted, produce varieties different from that of the parent. In France, two gentlemen made an experiment on this subject, by suffering nearly 8000 Pear trees, which had come from the seed, to bear fruit, and from among which they obtained nearly 800 new varieties, that were worth cultivating. Dwarf trees, and

What is meant by Di-Pentagynia, and what description of plants belong to this class and order? How is the genus *Pyrus* characterized? How many varieties of the *Pyrus* are the Romans said to have had? In what manner are new varieties of this genus said to have been produced in France?

early varieties of the Pear, may be produced by engrafting on Quince stocks.

GENUS *Mesembryanthemum*. Fig Marygold. The name is from the Greek, *mesembryia*, the mid-day, because the flowers usually expand at that time. The name is certainly unfortunate in respect to length, but corresponds well with the extent of this genus, of which the Encyc. of Plants contains descriptions of more than 300 species, besides many varieties, the whole being illustrated by nearly 100 engraved figures. The species, says this work, of this extensive genus, are singular, yet beautiful, and some even splendid plants. Their leaves are of odd shapes, and the habits of most of the sorts slovenly and insignificant, though some are grotesque; but the flowers make ample amends by their profusion, the brilliancy of their colors, and the length of time the species continue in flower. Few are annual, fewer biennial, many are perennial, and most are shrubby, especially towards the base.

The leaves of this genus are mostly opposite, thick, short, and blunt pointed, though some are acute; their forms also bear a family likeness, being tongue-shaped, spatulate, half-round, round, angular, dagger-shaped, hatchet-shaped, subulate, &c. All the species of this genus, except three, or four, which are natives of New Zealand, and New Holland, come from the Cape of Good Hope, and consequently are hot house plants. They are all evergreens, generally growing to the height of from three inches to a foot, though a few are three feet high. The flowers of perhaps seven eighths of the species are either pink, or yellow, though some are white, or purple, &c. and a few are striped. In general they blossom in April, May, June, or July.

Fig. 179.



The species, Fig. 179, here represented, is the White Fig-Marygold, (*Mesembryanthemum albidum*.) It grows three or four inches high, very smooth and white; leaves thick, three cornered, obtuse, with a point, and opposite; flowers yellow. The mode of flowering in most of the species is similar, and somewhat resembles that of the Marygold. In some of the species the fruit resembles the Fig, and hence the vulgar name,

What is said of the genus *Mesembryanthemum*?

Fig-Marygold. This genus is easily cultivated in pots, provided they are kept dry. They should have no water when in the dormant state, and only a moderate supply when growing freely, and at the flowering season. They require only sand, and the poorer and dryer the soil is, the more abundantly will they flower. Slips placed in pots of sand will take root. The well known Ice plant is a species of this genus.

ORDER III.—POLYGYNIA. *Stamens many, perigynous.*

Styles many.

The name of this order is from the Greek, *polys*, and *gynē*, and signifies many styles. Flowers having many stamens, that is, more than twenty, perigynous, that is, inserted into the calyx, and many styles, belong here.

GENUS *Rosa*. *Rosc.* Name from the Greek, *rodon*, red, from whence comes *Rosa*, Latin, and *Rose* English. The Rose has been a favorite flower among all civilized nations, from time immemorial. Its native country is unknown. The number of distinct species of this genus, are variously stated by different writers, the changes produced by cultivation being often such as to make it difficult to determine whether an individual should be ranked as a species, subspecies, or variety. In the Ency. of Plants, about ninety species are described, and the names of more than 300 garden varieties given, and Decandolle describes 146 species. The *Roses* have been the subject of many distinct and costly treatises. Prof. Lindley, of London, has written the most scientific work in the English language on the *Roses*. He has described upwards of 100 species, and sub-species, a part of which are illustrated by figures. In France, Redouté and Thory have published a work in folio, entitled *Les Roses*, containing plates of all the species and varieties of this flower; a very splendid and costly work. The catalogues of the Paris and London nursery men, contain not less than 500 names of the different species and varieties of *Roses*. And the house of Calvert & Co. near Rouen, advertise 900 sorts of this flower.

New varieties of the Rose are obtained from the seed, but the usual mode of propagation is by slips or layers. The Dutch have a method, said to be of modern invention, of

What description of plants belong to the order Polygynia of this class? Whence comes the name of the rose? How many species and varieties of the rose are said to have been described?

making the smaller and finer varieties grow on the stocks of the larger kinds. The Dog Rose, the Tree Rose, and other common species, grow 10 or 12 feet high, and may be set in lawns, or yards where the ground is not to be broken. The dwarf kinds, besides being more beautiful, require culture at the root. The Dutch method is to bud several varieties of the dwarf, on the larger stalks, and thus to produce a tree, composed of various, and differently colored species of living Roses. It is obvious that the beauty of such a compound tree will depend much on the taste of the culturer, in arranging his varieties. The dwarf species are said to be preserved in this manner longer than by the usual mode of culture.

The nursery men call their roses by various names often of their own invention; and being like others, aware how much great names and high sounding titles influence the world, it is curious to observe how constantly they attempt to employ this circumstance to enhance the sale and price of their goods. Thus we have Roses named Royal crimson, Purple crimson, Grand Sultan, Henry IV., Dutchess of Orleans, Josephine, Napoleon, King of France, Glory of the World, &c. The species of the Rose are chiefly deciduous shrubs. There are a few, however, which are evergreens, and several which trail upon the ground. In general, they grow from a few inches to four or six feet high. A few species assume the height of trees. Lady Banks' Rose, grows twenty feet high, and the Persian Rose tree is said to be thirty feet in height.

It is a remarkable fact that no species of the Rose has been found native in the southern hemisphere.

CLASS XIII.—POLYANDRIA. *Stamens many, inserted on the receptacle. Orders 7.*

Fig. N.



The name of this class is derived from the Greek *polys*, many, and *aner*, a stamen, and means *many stamens*. The stamens in this class, instead of being inserted into the calyx, as in Icosandria, grow on the receptacle; or end of the stem, and under the germen. It is a curious circumstance, that plants with their

What is the Dutch method of making rose trees? What is meant by deciduous shrubs? To what height are some rose trees said to grow? How many stamens belong to the plants of the class Polyandria? On what part of the plant do the stamens of this class grow?

stamens growing on the receptacle are often poisonous, while those having their stamens inserted into their calyxes are generally wholesome. The great number of edible fruits in the last class, and the variety of noxious ones in this, confirms this observation. The number of stamens in this class being indefinite, though more than twenty, will not distinguish it from Icosandria. But the place of insertion will always show the difference. The stamens are always distinct, that is, not coherent in any part of their length, or distributed into parcels.

This class is of considerable magnitude, though not important like the last in embracing many esculent vegetables. Some of the noblest genera of the forest, as the Magnolia, and some of the most beautiful aquatic plants belong here. It also includes the Poppy, the curious Side-saddle flower, the Peonia, and the Custard Apple.

ORDER I.—MONANDRIA. *Stamens many. Style 1.*

GENUS *Capparis*. Caper-tree. Name, from the Greek *Kapparis*, which is derived from the Arabic *Kabar*. This is a genus of low shrubs, some of which produce berries, and others pods. The common Caper, (*Capparis spinosa*,) is the species from which the pickled Capers are obtained. The flower bud is chiefly employed for this purpose, though in Italy the unripe fruit is prepared instead of the bud. In the isles of the Mediterranean and near Toulon, the flower buds of the Caper are gathered just before they begin to expand, and are thrown into vessels containing salt and vinegar. When the gathering season is over, the contents of these vessels are poured out, and the buds are assorted according to their size and color, the smallest and greenest being considered the best. The different sorts are then put into small casks with fresh vinegar, and are then ready for sale. In this state they are said to remain fit for use five or six years. It is said to be a common practice to put copper filings into the first pickle, to save vinegar, and give the buds a green color.

To this order belong the genera Bloodroot, (*Sanguinaria*,) Celandine, (*Chelidonium*,) and the Poppy.

GENUS *Papaver*. Poppy. Name, from the Celtic, *papa*,

Are the stamens in this class distinct or united? From what plant and what part of the plant are the capers of commerce produced? What other plants are mentioned as belonging to this class?

which signifies *pap*, because the seeds were formerly boiled in the pap, or food of infants, in order to make them sleep. The word *opium*, is derived from the Greek *opos*,² juice. There are several species of this genus, some of which are common in our gardens. The Opium Poppy, (*Papaver somniferum*,) is the species cultivated for the purpose of obtaining that powerful narcotic poison, opium. This plant is cultivated in many parts of Europe, at the present day, not for its opium, but for the bland oil its seeds contain, and the capsules, or heads, which are dried and sold to apothecaries. In Persia, Turkey, and India, this plant is grown for its inspissated juice, which in warm climates only, affords good opium. In these countries the opium is collected by making slight incisions on each side of the half grown capsule, or poppy head. This is done towards evening, and in the morning the exuded milky juice, being thickened by evaporation to the consistence of a paste, is scraped off by women and children and put into earthen pots. During the day this is worked by wooden spatulas in the sun, until it attains a considerable thickness. It is then formed by hand into cakes, as we see it, and covered with leaves in order to prevent their adhering to each other. It is obvious that the labor of collecting opium in this manner, and in no other can it be obtained pure, must be very great; hence the temptation to adulterate this drug, which is said to be the practice in every country where it is produced for sale. The substances used for this purpose are chiefly the extract of the poppy obtained by boiling; oil of sessamum; ashes and the dried leaves of the poppy; sand; extract of liquorice; gum Arabic, &c.

GENUS *Sarracenia*. Side-saddle flower. Tournefort named this plant in honor of Dr. Sarrazin, of Quebec, who sent the genus to him from Canada. It is called Side-saddle flower, from the resemblance of its expanded stigma to a woman's pillion. This highly curious genus consists of five species, all of them natives of North America, and hitherto found nowhere else. The Purple *Sarracenia*, (*Sarracenia purpurea*,) is the most common species, and perhaps the only one growing in the northern States.

What is the derivation of the word poppy? In what climates does the poppy afford good opium? In what manner is opium obtained? How did the genus *Sarracenia* obtain its name? What peculiarity has the genus *Sarracenia*? In what country only are they found native?

There is however a variety with yellow flowers. This plant is cultivated in Europe as a curiosity. The stem, which is a scape, rises to the height of a foot or more, and bears a single terminal flower, which is large, nodding, and of a deep reddish purple. The petals are five, and of an oval shape. The germ is globular, and covered by the stigma, this being divided into five lobes, the segments of which expand like an umbrella, and falling down, alternate with the petals. There is an exterior calyx, composed of three leaves, and an interior one composed of five; these are nearly purple. The leaves are all radical, and are composed of a large hollow tube, swelling in the middle, contracted downwards, and ending in a short petiole. The mouth of the tube, or leaf, is contracted, and furnished with a spreading, heart-shaped appendage. The leaves lie on the ground with their mouths turned upwards, so as to catch the rain as it falls. They hold nearly a wine-glass full of water, and are seldom found empty. The whole genus are aquatic, and are found in wet boggy places. These plants thrive very well in pots filled with turfy peat, or swamp soil, the upper part containing some water moss, and the pot being placed in a pan of water. They flower in June and July, and may be found in many swamps in New England.

GENUS *Nymphaea*. Water Lily. Name, from Nymph, a Naiad of streams. This is a beautiful genus of aquatic, perennial flowers. The white Water Lily, which is common in brooks and ponds, has a large white flower, with a yellow centre, and four sepals, which are green without and white within. Few flowers possess a more exquisite fragrance than this. The leaves are orbicular, cordate, and emarginate, with the lobes toothed. This species, the *Nymphaea odorata*, or fragrant Water Lily, often grows where the water is ten or twelve feet deep. The flowers expand in the morning and close in the afternoon. The roots are of the size of a man's arm, and have been used as emollients in medicine. The yellow Pond Lily belongs to the genus *Nuphar*, of which we have two species, one with a calyx of five leaves, and the other with a calyx of six. It is said that crickets and cockroaches are destroyed by these roots, bruised and mixed with milk.

What are the botanical names of the white and yellow pond lilies?

GENUS *Bixa*. Arnotto Tree. This tree grows in the West Indies, and rises to the height of twenty feet. The Arnotto, a paint with which cheese and butter are colored, is prepared from the pulp which covers the seeds of this plant. The fruit being macerated in hot water, the seeds are separated, and the remaining pulp being purified, and the water evaporated, forms the coloring substance in question. The natives of hot climates use pieces of this wood to obtain fire by friction. The *Lime*, or *Linden* tree, known also by the name of *Basswood*, the *Tilia* of botanists, belongs here. Also the *Peony*, and *Cistus*, or *Rock-rose*.

ORDER II.—DI-PENTAGYNIA. *Stamens many. Styles 2—5.*

We had occasion to explain the name of this order under the head of *Icosandria*, where it is employed as well as here.

In the original Linnæan arrangement, the orders *Digynia*, *Trigynia*, and *Tetragynia* were used instead of *Di-Pentagynia*. But the styles from *Digynia* to *Pentagynia* inclusive, being from two to five, these orders are now embraced in the present one.

GENUS *Delphinium*. Larkspur. Name, from the Greek, *delphin*, a dolphin, on account of the resemblance of the nectary of this plant to the imaginary figures of that fish. The species are well known annual, or perennial plants, all of them either blue, purple, or red, but never yellow. This genus has no calyx; the petals are five, and unequal. The appendage called the spur, or nectary, is common to all the species.

The *Aconitum*, or *Wolf's bane*, all the species of which are poisonous to a high degree, belongs here. This is also the place of the *Columbine*, (*Aquilegia*), a common, hardy, perennial herbaceous plant, which springs up early in the spring, and continues to flower from May to July.

ORDER III.—POLYGYNIA. *Stamens many. Styles many.*

GENUS *Liriodendron*. Tulip Tree. Name, from the Greek, *leirion*, a lily, and *dendron*, a tree. This is a native of North America, and is among the tallest and most beautiful of our forest trees. The flowers are produced at the ends of the branches, and resemble the tulip, rather than

How is *arnotto* obtained? What is said of the *larkspur*? Whence comes the name of the genus *Liriodendron*?

the lily. The petals are from six to twenty-seven in number, the outer ones oblong, and the inner ones lanceolate. The leaves are on petioles, large, glossy, and panduriform, or guitar shaped. The trunk is smooth, straight, and sometimes nearly an hundred feet high, and when covered with its Tulip-like blossoms, has a magnificent appearance. There is a variety, in which the lobes of the leaves are obtuse, and the petals all ovate, and of a yellowish color. This genus has been transported to Europe, where it is now common, but seldom grows to the height of more than fifty or sixty feet.

GENUS *Magnolia*. Beaver Tree. Name, in honor of Professor Magnol, of Montpelier, the author of several botanical works. This genus consists of many species, eight of which are natives of North America. Most of the species are superb trees, and some of them, as the Laurel-leaved, (*Magnolia grandiflora*,) are among the most beautiful and magnificent of vegetables. The leaves of this species are a foot or more long, and not unlike those of the common Laurel. The flower is produced at the end of the branches, is very large, and composed of about eight white petals, which are narrow at the base, but broad and waved at their extremities. Some of the species are deciduous, and others are evergreens.

GENUS *Annona*. Custard-Apple. The name appears to be a corruption of *menona*, by which name this fruit is known among some of the natives of the tropics. The genus consists of several species of trees, some of which produce berries of the size of an orange. One species grows wild in Jamaica, another in Peru, and another in Carolina.

Fig. 181.



The fruit is succulent, a little acid, and very agreeable to new comers into hot climates. In some part of South America, it is highly esteemed as a delicious fruit, and is generally eaten by the natives of the tropics. In some species the fruit is rough or netted, as in the *reticulata*, Fig. 181. In others it is smooth.

What is said of the genus *Magnolia*? What is the custard-apple, and what is its use?

GENUS *Ranunculus*. Crow-foot. Name, from *rana*, the Latin name of frog, because many of the species grow in wet places inhabited by that reptile. This is a large genus of acrid, bulbous, or tuberous rooted, perennial plants. We have many species in our fields and meadows, one of which, the Butter Cup, (*Ranunculus acris*,) is very common in rich, moist places. It rises from one to two feet high; leaves cut into three or five principal divisions; flowers intensely yellow, and glossy, as though varnished. The root is tuberous, and this as well as all the other parts of the plant are highly acrid, and will blister the skin. It is said that beggars sometimes make use of this as a means to produce blisters, in order to excite compassion. Some of the species of this genus are double, and being nearly of the size of roses are highly valued by florists, as commanding considerable prices. The Double Orange Ranunculus, (*Ranunculus Asiaticus*,) is a splendid yellow flower.

The genera Anemone, Clematis, or Virgin's Bower, Hepatica, Hellebore, and the Hydropeltis, are all native plants, and well worthy the examination of the student in botany.

CLASS XIV.—DIDYNAMIA. *Stamens 4, 2 long and 2 short. Orders 2.*

Fig. O.



The name of this class comes from *dis*, twice, *dys*, two, and *nema*, a filament, and is understood to signify four stamens, two of which are longer than the others, as represented by the attached figure. This class, with the exception of Gynandria, and Syngenesia, is the most natural and best defined of all the Linnæan classes. It is divided into two orders, called *Gymnospermia*, and *Angiospermia*. The first comes from *gymnos*, naked, and *sperma*, a seed, and therefore means, that in this order the seeds are naked. The second comes from *aggeion*, a vessel, and *sperma*, a seed, and signifies that the seeds are in a vessel, that is, enclosed in a pericarp.

ORDER I.—GYMNOSPERMIA. *Stamens 4. Seeds 4, naked.*

This order answers to the natural tribe of Labiate plants, with the exception of a few genera, which are excluded from

What is the origin of the word *Ranunculus*? What is the general character of this genus? What is the number and what the comparative length of the stamens in the class *Didynamia*? How many orders has the class *Didynamia*? How is the order *Gymnospermia* characterized?

this order, on account of their having only two stamens, and which are placed in the class Diandria. The order embraces many valuable herbaceous, aromatic genera, which are in universal use as kitchen condiments. Among these are the well known Marjoram, Mint, Thyme, Balm, &c. Hysop, Summer Savory, Catmint, Lavender, Archangel, Betony, Horehound, Motherwort, and Calamint, also belong here.

GENUS *Nepeta*. Cat-mint. Name, said by Linnæus to be derived from *Nepes*, a town in Tuscany. Common Catmint, (*Nepeta cataria*,) is said to have had its name from the fondness of cats for this plant, especially when it is withered. Hence it is said that these animals will destroy such plants as have been recently transplanted, while they will not touch those that are vigorously growing. An English botanist confirmed this by experiment. He set plants from another part of his garden, within two feet of others which were growing from the seed, and found by repeated trials, that these were destroyed by the cats, while the others remained untouched. The true reason appears to be, that the odor of the plant is strongest, and therefore most attractive to the cats, when it is a little withered, or bruised, by the act of transplanting. The old vulgar saying,

"If you set it,
The cats will eat it;
If you sow it
The cats will not know it,"

seems to be founded on this observation.

ORDER II.—ANGIOSPERMIA. *Stamens 4. Seeds many, enclosed.*

GENUS *Bignonia*. Trumpet Flower. Name, from the Abbe Bignon, librarian to Louis XIV. This is a genus of beautiful plants, most of them climbers, some deciduous, and others evergreen, and chiefly natives of hot climates. The leaves are opposite, pinnate, ternate, or conjugate. The flowers are in panicles, with spreading petals, of various colors in different species, as red, blue, yellow, or white. *Bignonia radicans*, known under the name of *Trumpet Flower*, is a native of the southern states and is common by cultivation in all parts of New England. The flowers are yellowish scarlet; the corolla trumpet shaped, and thrice as long as the calyx; leaves pinnate; leaflets ovate, acuminate,

What plants fall under the order Angiospermia? What well known aromatic plants belong to the first order? What is said of the genus *Bignonia*?

and toothed. It climbs to the height of 30 or 40 feet, and will adhere to the side of a wooden building with great tenacity.

GENUS *Linnæa*. Name, in honor of the celebrated Carl Von Linne, "the reformer of natural history, and the father of the modern physical sciences." This genus contains only a single species, called *Linnæa borealis*, and is not described here on its own account. It is a small, branched, evergreen, creeping plant; leaves opposite; calyx double; that of the fruit two-leaved; that of the flower five-parted; corolla campanulate; berry dry and three celled. It rises about three or four inches from the ground, and according to a remark formerly quoted, is an "object, depressed," creeping plant, long overlooked, and when found has neither apparent use, nor beauty. It is sometimes arranged in the class Tetrandria, which would be its place were its stamens of the same length. It is a native of Sweden and North America, and is found in mountain woods.

GENUS *Digitalis*. Fox Glove. Name, from *digitabulum*, a thimble, in allusion to the form of the flowers. This genus contains about 20 species, none of which are natives of America. The purple Foxglove (*Digitalis purpurea*,) grows wild in different parts of Great Britain, where, among neglected hedges and copses, it is one of their most ornamental flowers. There is a variety bearing white flowers. The large, tall, crowded spikes of this species, give it a conspicuous appearance among the border flowers of our gardens. The multitude of spotted bell shaped corollas, and the high coloring of the purple kind, give it a very striking aspect, so that the most ignorant and incurious spectator will always inquire its name and use. This species is a violent poison, but at the same time a valuable medicine. For this purpose the leaves are employed, both in powder, and in the form of a spirituous tincture.

Scrophularia, (*Figwort*) *Antirrhinum*, (*Toad flax*,) *Pedicularis*, (*Louse-wort*,) *Gerardia* and *Mimulus*, (*Monkey-flower*,) are native genera belonging here, and are all worthy of examination.

Whence does the plant *Linnæa* derive its name? From what circumstance does the *Digitalis* take its name? What are the qualities of *digitalis*?

CLASS XV — TETRADYNAMIA. *Stamens 6, 4 long, 2 short. Orders 2.*

Fig. P.



The name of this class comes from *tetra*, four, *dys*, two, and *nema*, a filament, and in its present application means, that the flowers which belong here must have six stamens, two of which are shorter than the others. This is considered among the most natural of all the Linnæan classes. It is, indeed, with the exception of a single genus (*Cleome*,) an entirely natural tribe, consisting wholly of cruciform flowers, as Cabbage, Mustard, &c. This class has usually been divided into two orders, founded on the length of the pod, which the genera presented. The order *Siliquosa* including such fruit as consisted of a long pod, and *Siliculosa* such as presented a short one. Now these distinctions are not only ambiguous, and often very perplexing, (for we cannot distinguish by the flower, as is usual where a specimen belongs, but must wait for the fruit,) but they also prevent the distribution of the genera according to their natural affinities. These orders are therefore rejected by M. Decandolle, and other botanists, and other divisions substituted, depending upon variations in the relative position of the various parts of the seed.

Our present purpose will be answered by omitting to arrange the genera with reference to the above named orders. And by omitting the distinctions of M. Decandolle, also, we shall lessen the perplexity, and add to the comfort of our students. We should, however, recommend to them a more intimate knowledge of this class than can here be obtained. Among the most common plants of this class are *Lunaria*, (*Satin flower*,) *Raphanus*, (*Radish*,) *Brassica*, (*Turnip and Cabbage*,) *Sinapis*, (*Mustard*,) *Lepidium*, (*Peppergrass*,) *Thlaspi*, (*Shepherd's Purse*,) *Sisymbrium*, (*Hedge Mustard*,) *Cheiranthus*, (*Wall Flower*,) and *Nasturtium*, (*Water Cress*,).

GENUS *Nasturtium*. The name, according to Pliny, comes from *nasus tortus*, convulsed nose, in allusion to the effect it produces on the nose when eaten. In England the

How may a plant of the class Tetradynamia be known by its stamens? What is said of the former divisions of this class? What are the names of some of the plants belonging to this class?

Water Cress, which is a species of this genus, is a very popular salad. It grows in streams of water, and may be found in many of our running brooks, and frequently in ponds. The leaves are pinnatifid, with ovate segments, and most of them surround the stalk under the water. The pods are small, and stand nearly erect, on spreading foot stalks. The taste is like that of Peppergrass, (*Lepidium*.) Near Richmansworth, in Hertfordshire, says Loudon, there is a fine stream of water, on a chalky bottom, in which one cultivator grows five acres of this plant, and sends a supply to London every day in the year, Sundays excepted. There are also large plantations of it at Uxbridge, Gravesend, and other places, for the London market.

Fig. 184.



The figure represents the English cultivated Water Cress, (*Nasturtium officinale*.) Our Nasturtion is the Indian Cress, (*Tropæolum majus*.)

GENUS *Cochlearia*. Scurvy Grass. Horse Radish. Name, from *cochlear*, a spoon, because the leaves are convex, like the bowl of a spoon. Horse Radish is a well known condiment to roast beef, veal, and other meats, especially in the early spring, when most sallads are out of season. The root being grated and mixed with vinegar, is much esteemed by the lovers of high seasoning.

CLASS XVI.—MONADELPHIA. Orders 7.

Fig. Q. The name of this class is derived from the Greek words, *monos*, one, and *adelphos*, brother, and alludes to the circumstance, that the filaments of the flowers belonging here are united together, in some part, or throughout the whole length. This is the characteristic distinction of the class. The anthers are separate, and the filaments may also be separate

In what manner is the water cress cultivated, and for what purpose? How is the class Monadelphia distinguished? What are among the most important tribes of plants belonging to this class? On what do the orders in this class depend.

except at their bases. The most important tribes in this class are the Geranium, the Passion flower, the Mallows, the Stork's bill, the Althæa, the Hibiscus, and the Camellia, which contains the Tea plant. The orders in this class depend on the number of stamens, and not on that of the styles, as in the former classes.

ORDER I.—TRIANDRIA. *Stamens 3.*

GENUS *Tamarindus*. Tamarind tree. Name, Latinized from the Arabic *Tamar-hindy*, or Indian Date. The Tamarind tree is a native of the East and West Indies, and of Arabia, and Egypt. It is a large, beautiful spreading tree. The leaves are abruptly pinnate, composed of sixteen or eighteen pairs of sessile leaflets, half an inch only in length, and one sixth of an inch broad, of a bright green color, downy, entire, and obtuse. The flowers are in loose bunches of five, or six, which grow on the sides of the branches; petals yellowish, and beautifully variegated with red veins; filaments purplish, bearing incumbent brownish anthers; pods, when ripe, of a dull brown color, those from the West Indies from two to five inches long, those from the East Indies twice this length. In the West Indies the pods are gathered in June, July, and August, when fully ripe, and being placed in a cask, boiling syrup is poured on them until the vessel is full, when it is headed up, and is ready for sale. The East India Tamarinds are darker and drier, and are said to be preserved without sugar, but by what process we are not informed.

GENUS *Tigridia*. Tiger flower. Name, from the spots on its petals, which, however, rather resemble those of the Leopard. This splendid flower has a two leaved spathe, no calyx, six petals, the two outer ones large, and the filaments united into a long tube; leaves ensiform, or shaped like a straight sword, and nerved. This beautiful genus came originally from Mexico. It flowers in our gardens, but requires protection from the winter frosts.

There is only one species, and a single variety of this genus.

In what country does the tamarind tree grow, and how is its fruit preserved?

ORDER II.—PENTANDRIA. *Stamens 5.*

Fig. 186.



GENUS *Passiflora*. Passion Flower.— Thus called because the anthers are so fixed to their filaments as to represent a cross, the emblem of Christ's passion. This is a beautiful genus of climbing plants, a part of them herbaceous, and a part woody. There are nearly fifty species growing in England, not one of which, however, is a native of that country. Several are from America, but the greatest number from the West Indies. Several species and varieties are cultivated in the hot houses of this country, and few flowers are more striking in appearance, or really more beautiful. Several of the species bear fruit, which is highly delicious. The Sweet Calabash, (*Passiflora maliformis*,) of the West Indies, is one of these species. The flowers are large, and the colors red, white and blue, in rings, as is usual in this genus. The fruit is of the size of a large apple, yellow when ripe, with a rind enclosing a sweet pulp, with many seeds of a brownish color. This is served up in deserts, and is highly esteemed. The common species, (*Passiflora carulea*,) is one of the most elegant of this tribe. In its native country, (South America,) it has a woody stem, of the size of a man's arm, and climbs to a great height. Leaves palmate, five parted, and entire; involucre three leaved. Flower, composed of petals, which are white, and nectaries, or crown, consisting of long threads within the petals, and colored purple and blue. These are not so long as the petals, (see the figure.) The pistils and stamens present a contrast of various colors. The fruit is egg-shaped, but is not agreeable to the taste. The species *lutea* and *incarnata* are natives of North America.

ORDER III.—HEPTANDRIA. *Stamens 7.*

GENUS *Pelargonium*. Stork's bill. Name from *pelargos*, a stork, in allusion to the beak of the fruit, which is thought to resemble the bill of that bird. This genus formerly made a part of the Linnæan genus *Geranium*, or Crane's bill, from which its species have been detached, forming by themselves, a vast and favorite tribe of green-

Why is the passion flower so called? What is said of the passion flower genus? How does the genus *Pelargonium* obtain its name?

house plants. The small genus *Erodium*, (*Heron's bill*,) has also been removed from the *Geraniums*.

These three genera are all cultivated and known under the name of *Geraniums*. They may be distinguished by the following descriptions.

The genus *Erodium*, (*Heron's bill*,) has five stamens; calyx five leaved; petals five; scales five, alternate with the filaments, and honey glands at the base of the stamens; anthers or cocci, five, one seeded, awned, at the base of a rostrate, or beaked receptacle.

The *Pelargoniums* have seven stamens; calyx five parted, the upper segment ending in a nectariferous tube running down the peduncle, or flower stalk; corolla five petalled, irregular, the two upper petals usually broader, with colored veins. The filaments are ten, of which three are usually without anthers.

The *Geraniums* have ten stamens; calyx five leaved; petals five, regular; glands five, honey-bearing, and united to the base of the longer filaments.

The most obvious differences between the three kinds when in flower, are, 1st. The *Heron's bill* has five stamens, and five scales alternating with the filaments. 2d. The *Stork's bill* has seven anthers, and three naked filaments, with the two upper petals broader than the others, and colored veins running through them; also the upper segment of the calyx ending in a tube, runs down the foot stalk. 3d. The *Crane's bill* has ten stamens, and as many anthers; a regular corolla, that is, with petals alike; wants the scales of the first, and the colored veins, and the tube running down the foot-stalk of the second.

The *Erodiums* consist of hardy plants of no great beauty. The *Geraniums* present some beautiful species, but many of them are mere weeds, possessing neither use nor beauty, and are natives of different parts of Europe and America.

The genus *Pelargonium* came almost entirely from the Cape of Good Hope, and consists of an immense number of species and varieties. A taste for this tribe seems to pervade most parts of the civilized world, there being hardly a family in the populous parts of Europe or America, but what have their *Geraniums* as an established part of their house-

How are the genera *erodium*, *pelargonium*, and *geranium* distinguished from each other? From what country are most of the *pelargoniums* derived?

hold property. The number of species described by Loudon amounts to nearly two hundred, besides a catalogue of 179 varieties. Mr. Sweet, an English botanist and cultivator, has published a work on this tribe, in which not only all the species formed by the hand of nature, but all the varieties are described and figured. Most of the species are tuberous rooted plants, or shrubs, which are perennial in the green houses of our climate. The majority of them are of very easy cultivation, and bear the confined air of sitting rooms better than most ornamental flowers. Some one of them is in flower nearly every month of the year, and some individuals continue to blossom during all the summer months, and a few as the Rose scented, flowers from April to August. The fleshy, and thick stemmed species, as the holy-hock leaved, are by far the most rare and valuable, but are much less easily cultivated than the more common kinds. The height to which the different species grow, varies from six inches to five feet; there are few, however, which rise higher than three feet. These plants require a rich, light soil, as a mixture of loam and peat, or decayed leaves from the woods. Only a few of the *Geranium* species, properly so called, are cultivated, nearly all those generally called *Geraniums* being of the *Pelargonium* genus.

ORDER IV.—OCTANDRIA. *Stamens 8.*

This order contains only a few rare plants, and nothing worth notice.

ORDER V.—DECANDRIA. *Stamens 10.*

GENUS *Geranium*. Crane's bill. The anemone leaved species, which came from the Cape, is a most splendid plant, having large, fern-like, glossy leaves, of the most delicate green, with a fine red blossom, larger than half a crown. The Lancashire, and Bloody Species, are also beautiful plants. In this country, there is a common native species, called Spotted Crane's bill, (*Geranium maculatum*), which grows in woody places, and bears a pretty purple flower. The root is knotty, and is employed in medicine as an astringent.

ORDER VI.—POLYANDRIA. *Stamens many.*

This order contains several extensive genera, as *Malva*,

What is said of the number of species and varieties of the stork's bill? Is it the pelargoniums, or the geraniums, that are chiefly cultivated?

(*Mallow*,) *Hibiscus*, and *Sida*. Also a few important ones, as *Gossypium*, (*Cotton*,) and *Camellia*, (*Tea*.)

GENUS *Hibiscus*. This is one of the Greek names of Mallow. The genus is large, and contains some valuable plants. The bark of one species, the Lime-tree leaved, (*Hibiscus tiliaceus*,) is employed in the Sandwich islands for the purpose of making mats, ropes, lines, nets, &c. The whole genus abounds in mucilage, and some of the inhabitants of the South Sea islands, it is said, suck the bark for food in times of scarcity. The Okra, (*Hibiscus esculentus*,) so much esteemed in some parts of France and the West Indies, as an ingredient in soups, is one of this genus. This grows four or five feet high, and is easily raised in our gardens. The Syrian Mallow, (*Hibiscus Syriacus*,) called *Althæa*, is a well known shrub growing eight or ten feet high, and is so hardy as to bear our winters. This will propagate by layers or cuttings.

GENUS *Althæa*. Marsh Mallow. Name from the Greek *altho*, to cure, because it was supposed to be highly efficacious as a medicine. The common Marsh mallow, (*Althæa officinalis*,) is still employed as a demulcent in medicine. The Holyhock, (*Althæa rosea*,) came originally from China, and affords twenty or thirty splendid varieties of border flowers, some of which rise to the height of ten or twelve feet.

GENUS *Gossypium*. Cotton. Name from the Arabic *goz*, a silky substance, from whence the Latins derived *gossypium*, cotton. This is a very important genus, as furnishing the down or wool of which cotton cloth is made. The down is contained in a capsule, along with the seeds. There are several species of this genus cultivated for this purpose, in different parts of the world. The genus contains ten species, which differ in height from three to twelve feet. In all the species, the calyx is double, and the capsules five celled. In the West Indies, the kind called hairy, (*Gossypium hirsutum*,) which grows three feet high, is raised. This is a handsome plant, with palmated leaves, the lower ones five, and the upper ones three lobed. It is believed that this and the common species are chiefly cultivated in this country. In China and the East Indies, the

What important plants are contained in the order Polyandria of this class? What is said of the genus *Hibiscus*? What species of the Cotton genus are chiefly cultivated?

common, (*G. herbaceum*), and the tree, (*G. arboreum*), kinds are chiefly cultivated. The Tree Cotton in the East, is an evergreen, and grows twelve or fifteen feet high. The species which produces the nankeen colored cotton wool in China, has not been introduced into Europe.

GENUS *Camellia*. Japan Rose. Tea Tree. Name in honor of George Camellus, a Jesuit, and the author of some learned works. This genus contains some species, which, in relation to commerce, are the most important of all shrubs, and others which are universally admired for their beauty and fragrance. Bohea Tea, (*Camellia Bohea*), and green Tea, (*Camellia viridis*), are the species which chiefly furnish the tea of commerce. These are both evergreen shrubs, about four feet high and natives of China. In that empire, the Tea districts extend from the twenty-seventh to the thirty-fifth degree of north latitude. The plants are raised from seeds, three or four being placed together. The young shoots require little care, except now and then removing the weeds from their roots. The third year after planting, the leaves are gathered in three successive crops, in the months of February, April, and June. The gathering is a business of care and patience. The leaves are plucked off one by one. At the first gathering only the unexpanded and most tender are taken; at the second, those that are nearly and quite full grown, the tenderest being selected; and at the third, the coarsest, being the refuse of the other pickings, are taken. The first picking forms what European and American merchants call Imperial tea, and the second and third, the kinds known under the names of Green, Black, and Bohea Teas. It appears, therefore, that the qualities of the tea depend on the time at which it is picked, and not on the species of the plant, as was formerly thought.

The tea leaves being gathered, are cured in houses, which contain from five to ten, or twenty small furnaces, about three feet high, each having at the top a large flat iron pan. There is also a long low table, covered with mats, on which the leaves are laid and rolled by workmen sitting round it. The iron pan being heated by the furnace, a few pounds of the fresh gathered leaves are put upon it; the

What is the botanical name of the Tea genus? How are the tea plants raised? When are the crops of tea leaves gathered? On what do the different qualities of the tea depend?

most juicy leaves snap, when they first touch the pan, because a little of their moisture is turned into steam, and it is the business of the workman to shift their positions as often as possible, with his bare hands, until they become too hot to be easily endured. At this instant he removes the whole batch with a kind of shovel and throws them on the mat, around which sit the rollers, who, taking small quantities at a time in the palms of their hands, roll them in such a manner as to give each leaf a curl. At the same time, others blow the leaves with fans, in order to make them cool the more quickly, and the longer to retain their curls. This process is repeated two or three times, or until all the moisture is expelled from the leaves, the iron pans being less heated at each time. When the tea is perfectly dry, it is thrown into boxes of various capacities, and is then ready for sale. Dr. Abel, from whose narrative these facts are obtained, states that by far the strongest tea he tasted in China was called *Yutien*, and was used only on occasions of ceremony. This consisted of buds and half expanded leaves of the plant, and scarcely colored the water.

The Japan Rose, (*Camellia Japonica*), is a member of this family. In the gardens and groves of Japan, some of its species grow to the magnitude of trees, and with their polished deep green leaves, their fine forms, and their elegant, white, or red flowers, single, or double, form one of the most splendid objects in the vegetable kingdom. These plants are greatly admired in China as well as in Japan, and many varieties exist in the latter country, which have been obtained in Europe and America. Eighteen or twenty varieties, depending on the color and size of the flower, the shape of the leaf, and whether the flower be double or single, are cultivated in England, and many of them in this country. The single red *Camellia* grows by cuttings, or layers, and on this the other varieties may be produced by budding or engrafting.

The generic description of *Camellia* is contained in few words. Calyx imbricated, many leaved, the inner leaflets largest. The *Camellia Japonica* is characterized by "leaves ovate acuminate, acutely serrate, flowers terminal, subsolitary."

How are the tea leaves cured?

CLASS XVII.—DIADELPHIA. *Stamens united in two parcels. Orders 4.*

Fig. R.



The name of this class comes from *dis*, twice, and *adelphos*, a brother, and is usually called *two brotherhoods*, in allusion to the union of the stamens into two distinct parcels. Provided the stamens are in two sets, it is not essential with respect to numbers how the division is made. In some instances the stamens are equally divided, and in others there is a single one in one set, and a half dozen or more in the other; the two parcels are often united at the base. The orders are distinguished by the number of their stamens. The flowers of this class are almost universally papilionaceous, or butterfly shaped.

With respect to this class as applicable to the useful purposes of man, it bears the very highest rank. All the varieties of beans, peas, vetches and lentils are Diadelphous plants, and many of the best grasses, as well as a variety of useful and ornamental trees, belong here. The genera are very unequally divided with respect to the orders, nearly nine tenths of the whole class having ten stamens, and therefore falling under the order Decandria.

ORDER I.—PENTANDRIA. *Stamens 5.*

This order contains only two genera, and these are without use or interest.

ORDER II.—HEXANDRIA. *Stamens 6.*

GENUS *Fumaria*. Fumitory. Name from *fumus*, smoke, in allusion to the disagreeable smell of the plant. *Fumaria officinalis* was formerly used in medicine. The species are chiefly handsome weeds.

ORDER III.—OCTANDRIA. *Stamens 8.*

GENUS *Polygala*. Milk-wort. Name from the Greek *polu*, much, and *gala*, milk, because some of the species were anciently supposed to excite the lactescent secretions. The only species worthy of notice is the Rattlesnake root, (*Polygala senega*.) which is employed in medicine in cases of asthma and catarrh. It is said also that the Indians employed this root as an antidote against the bite of the rattle-

How are plants of the class Diadelphia characterized? How are the orders of this class distinguished? What rank do the plants of this class bear, as applicable to the wants of man?

snake. The plant is found in our woods, grows about eight inches high, and bears a spike of white flowers.

ORDER IV.—DECANDRIA. *Stamens* 10.

GENUS *Pterocarpus*. Red Saunders. Name from *pteron*, a wing, and *karpus*, fruit, because its pods have membranous wings. The tree which furnishes the Red Saunders, (*Pterocarpus santalinus*), of commerce, grows in the East Indies, and attains the height of 60 or 70 feet. It has alternate branches and winged leaves, with bark resembling that of the Alder. The wood makes a fine red color, and is the article with which apothecaries color their drugs and medicines. It yields its color to spirits, but not to water.

GENUS *Phaseolus*. Kidney Bean. Name from *phaselus*, a little boat, which the pods somewhat resemble. The species are wholesome food, and several of them common in our gardens. The Common, Scarlet, Scimitar leaved, and Common Dwarf, are among the best species. Loudon says that the Dwarf kind may be grown through the whole winter, as a stove plant, and its pods are as good in mid-winter as in mid-summer.

GENUS *Lathyrus*. To this genus belong the Sweet Pea, (*Lathyrus odoratus*), the Everlasting Pea, the Earth Pea, Lord Anson's Pea, &c.

Several species of this tribe were employed as food in Germany during the last century, but produced such terrible effects on the consumers, that its use was forbidden by an edict of government. It is said that the flour of this tribe, mixed with one half of wheat flour, makes fine bread, which at first is harmless, but that after a time, it brings on a surprising rigidity of the limbs, so that such persons become cripples for the remainder of their lives. Swine fattened with this meal lose the use of their limbs entirely, but continue to grow fat, lying on the ground. Fabroni says that swine lose the use of their limbs, and become pitiable monsters by eating this flour.

GENUS *Pisum*. Pea. Name, from the Celtic. It is the most valuable of culinary legumes, and like many other domestic vegetables, its native country is unknown, having been in general use from time immemorial. The species of the genus are few, viz. Common Pea, (*Pisum sativum*), Field Pea, (*Pisum arvense*), and Sea Pea, (*P. maritimum*.)

What is said of the lathyrus, or sweet pea tribe, as food? What number of species belong to the Pea genus?

The varieties of the species are however very numerous, and differ widely from each other in respect to the height and productiveness of the vines, and the size and goodness of the fruit.

GENUS *Vicia*. Vetch. Name, from the Latin, *Vicia*. The genus contains about 40 species, but the only one of any considerable importance is the Garden Bean, (*Vicia faba*), a species which forms the new genus *Faba*, as differing from the *Vicia* in the size and shape of the legume. Of this there are many varieties, among which the small seeded Mazagan is the earliest, and the largest, the Windsor Bean. Field Beans, which are varieties of the garden kinds, are considered in England excellent food for hard working horses, and for fattening swine for bacon.

The student may, perhaps, be at a loss to know how it is that the different kinds of Bean do not belong to the same genus. If he will examine the various kinds, when in flower, he will observe the distinctions. In the genus *Phaseolus*, the keel, stamens, and style are spirally twisted together. In the genus *Vicia*, the style is transversely bearded beneath the stigma, and the three inferior segments of the calyx are long and straight. The legume of the *Phaseolus* tribe, is compressed, or flattened, and falcate, or sabre-form. Seeds, compressed and reniform, or kidney-shaped. Many of this genus are also annual evergreen plants in warm climates, that is, they continue to blossom and produce fruit during the whole year, and by green house protection may be made to do so in our climate.

The *Vicia* tribe are mostly deciduous climbers, that is, strictly annual plants. The *Faba*, or Garden Bean, called also Windsor Bean, has however an erect stem, with many flowers; legumes pointing upwards, short and tumid, not compressed like the legumes of the Kidney Beans. The Vetch tribe are not favorites for the table.

GENUS *Robinia*. Locust Tree. Name, in memory of Jean Robin, herbist to Henry IV. of France. The *Robinia pseudoacacia*, or Common Locust, is a well known, tall tree, cultivated every where, and highly esteemed by ship-builders, on account of the stiffness and durability of its timber. The Rose-acacia, (*Robinia hispida*), grows about ten feet high, and bears pink flowers; leaves pinnate, with

What is the difference between the generic characters of the garden and kidney beans? What are the plants mentioned as belonging to the genus *Robinia*?

an odd one; stem hispid, or beset with bristles; flowers in axillary racemes. This is an elegant shrub.

GENUS *Caragana*. Siberian Pear tree. Name, from *Carachana*, the appellation of this tree in Tartary. This species was formerly confounded with *Robinia*. Most of the species came originally from Siberia, where they only attain the size of shrubs, from one to six or eight feet high. The *Caragana Spinosa*, or thorny species, is beset with strong sharp thorns, several inches long, and is admirably adapted to form impenetrable hedges. About Pekin, Professor Pallas says, they stick limbs of this species in clay, on the tops of their walls, to prevent persons from getting over.

GENUS *Hedysarum*. Name, from *hedus*, sweet, and *aroma*, smell, because some species have a fragrant smell. This is a numerous genus, not remarkable for beauty, but containing several useful species, and that curious plant, the turning *Hedysarum*, (*Hedysarum gyrans*,) or the *Moving Plant*. This is a native of Bengal, and as Linnaeus observes, a very wonderful plant on account of its voluntary motion, which is not occasioned by any touch, or irritation, as in the *Mimosa*, (*Sensitive Plant*,). No sooner, continues Linnaeus, had the plants raised from seed acquired their ternate leaves, than they began to be in motion, this way and that; this movement did not cease during the whole course of their vegetation, nor were they observant of any time, order, or direction; one leaflet frequently revolved, whilst the other on the same petiole was quiescent; the whole plant was very seldom agitated, and that only during the first year; but sometimes most of the leaflets would be in motion at the same time. This motion does not depend on any external cause, as no artificial circumstance, such as touching, heat, cold, darkness, or light, will excite it, or prevent its continuance.

Fig. 188.



The moving plant, Fig. 188, grows three feet high, and is an evergreen herbaceous shrub; flower purple; leaves ternate, or growing by threes on a foot stalk, (see figure,) the lateral ones small.

GENUS *Indigofera*. Indigo plant. Name, from *Indigo*, the color, and *fero*, to bear, a plant bearing Indigo.' There are many species of this genus, mostly natives of the Cape of Good Hope, and several of them capable of yielding the blue dye. The species grow from one to four feet high, and are elegant little shrubs with pinnate leaves, and purple, or pink flowers. Indigo is one of the most profitable articles of culture in Hindostan. It is also cultivated to some extent in the West Indies. The seeds are sown in drills, and the plants are cut before they flower. The coloring matter is obtained by steeping the green plants in water, to which it is imparted in the form of fecula, and which subsides to the bottom of the vessel. The water being strained through cloth bags, the indigo is retained in the form of paste, and is then placed in shallow boxes, and suffered to dry in the shade. Before it is perfectly dry, it is cut into small pieces an inch square, and then being made perfectly dry, it is packed in skins, or boxes, for sale. Indigo is a precarious crop, on account of its being liable to destruction by hail storms.

Fig. 189.



The figure, 189, represents the *Indigofera tinctoria*, the species which is cultivated in India. Leaves pinnate, of four pairs; spikes or racemes axillary.

GENUS *Trifolium*. Trefoil. Name, from *tres*, three, and *folium*, a leaf, a plant with three leaves. Common Clover, (*Trifolium pratense*,) is a familiar example. Of this genus there are 140 or 150 species, nearly every country having one or two native kinds. The Red and White Clover are not excelled by any species of grass, for hay, and pasture.

GENUS *Medicago*. Medick. The name appears to come from the circumstance that this plant was a native of Media, whence it is said to have been carried to Greece, during the expedition of Darius. This is a large genus, and con-

What description is given of the *hedysarum gyrans*? What is said of the indigo plant, and the mode of procuring the indigo? What common grass belongs to the genus *Trifolium*? How is indigo prepared? What is stated about the genus *Medicago*?

tains several odd and curious species, and one or two which is cultivated as fodder for cattle. Most of these plants run, or trail upon the ground, though a few rise to the

Fig. 190.



height of four, or six feet without support. Lucern, Nonesuch, Snail, Turban, Medick, and several other singular looking species are of this genus. Our figure, Fig. 190, from Loudon, represents the Hedgehog Medick. The Lucern, (*Medicago sativa*), is cultivated as a grass.

CLASS XVIII.—POLYADELPHIA. *Stamens united into several parcels. Orders 2.*

The name of this class is derived from *polys*, many, and *adelphos*, brother; and signifies many brotherhoods; in allusion to the union of the stamens into many parcels. It is one of the smallest of the Linnæan classes, but consists almost entirely of plants, remarkable for their beauty, or usefulness. It includes the Orange, Lemon, and Lime, and the plant of which chocolate is made.

The orders are distinguished by the number of stamens.

ORDER 1.—DECANDRIA. *Stamens 10 or 12.*

GENUS *Theobroma*. Chocolate Nut. Name, of heathen origin, from *Theos*, God, and *broma*, food, in allusion to the excellence of its produce. There are two species of the Chocolate Nut tree, the smooth leaved, and the woolly leaved. It is the former, (*Theobroma cacao*), which produces the nut from which chocolate is prepared. The tree grows sixteen feet high, and produces a smooth fruit about three inches in diameter, with a thick rind, which contains about twenty-five seeds. These seeds being ground and mixed with a little arnotto oil, and perhaps some other ingredients, and made into paste, form the chocolate of the shops.

ORDER II.—POLYANDRIA. *Stamens many.*

GENUS *Citrus*. Orange Tree. Origin of the name, un-

What are the distinctive characters of the class Polydelphia? What does the word polydelphia signify? What important plants does this class include? What kind of tree produces the chocolate nut, and how is it prepared?

known. The golden apples of the heathens, and the forbidden fruit of the Jews are supposed to allude to this genus. The character, common to the citrus tribe, is that of low evergreen shrubs, with ovate, or oval lanceolate leaves, having serrate, or entire margins, and glossy upper surfaces. So far as is known, the species are all either from Asia or China. The species are only eight or ten, but the varieties are numerous. There have been several works published on the Oranges, among which that of Risso and Poiteau, printed at Paris, in 1818, is the most splendid. It is a folio volume, in which are described 169 sorts of this fruit, of which 105 sorts are figured, and their culture, both in France and Italy, detailed at great length. They are described as sweet Oranges, of which there are 42 sorts; Bitter and Sour Oranges, 32 sorts; Bergamots, 5 sorts; Limes, 8 sorts; Shaddocks, 6 sorts; Lumes, 12 sorts; Lemons, 46 sorts; Citrons, 17 sorts.

All the sorts may be propagated by seeds, layers, cuttings, engrafting, or inoculation.

The unengrafted often have axillary spines, or thorns, while the engrafted, or inoculated, are without this appendage. The flowers are on peduncles, either axillary or terminal. The fruits are a large berry, round or oblong, and generally of a yellow color. The species are best distinguished by the petiole, which in the Orange, and Shaddock, is winged, but in the Citron, Lemon, and Lime, is naked. The form of the fruit, although not quite constant, may also serve as a means of distinction. In the Orange, and Shaddock, it is spherical, or nearly round, with a redish yellow, or orange colored rind. In the Lime, the fruit is also nearly spherical, but a little oblong, and the color pale; in the Lemon, it is oblong, with a protuberance at the lower end, and of a yellow color; the Citron is oblong, with a very thick rind. The flowers of the Citron and Lemon have ten stamens, and those of the Orange more. In this genus it is very difficult to determine what is a species and what a variety.

CLASS XIX.—SYNGENESIA. *Stamens 5. Anthers united by their edges. Orders 5.*

The name is from the Greek, *syn*, together, and *genesis*,

What are the characters common to the citrus, or orange tribe? How may the orange tribe be propagated? How may the orange and shaddock trees be distinguished from the other species of this genus?

origin, and means that the anthers grow together in a single set, or tube. In addition to the number and union of the stamens, this class is characterized by the flowers being compound, that is, many individual small flowers, or *florets*, as they are called, are clustered together on a common receptacle, forming heads, as in the Daisy, Dandelion, and Thistle. These clusters, or heads, are surrounded by a common calyx, or more properly, an involucre.

This is one of the best defined and most extensive of all the Linnæan classes. Its importance to man, is not, however, in proportion to the number of its genera, though it contains many culinary and medicinal plants, and a large number of very popular ornamental species.

The inflorescence of the Syngenesious tribe differs so entirely from the classes heretofore described, that it becomes necessary to explain more particularly than we have done, the analogy between the various parts of these flowers, and those which the student is supposed to have already examined, and also to define the words used in describing them.

The *capitum*, or head, is a cluster of florets inserted on a common receptacle. Ex. Thistle, Dandelion.

Involucre, is the calyx, or lower and most external part of the head, and is composed of a greater or less number of green, or colored leaves, in the form of scales, either placed in a single circular row, or in several rows, one above the other. When these scales are in a single row, and united by their edges, the calyx is called one-leaved, or *monophyllous*; when in several rows, one above the other, it is called *imbricated*. If the external scales surround the internal at the base, the involucre is said to be *calyculate*, or calyculate.

The *receptacle* is the upper termination of the stem, or stipe, enlarged, and surrounded by the involucre. On the expanded surface of the receptacle sit the florets, crowded thickly together, and forming the head.

Each *floret* consists of a tube or corolla, and a germen, which, when ripe, forms the seed.

What does the term Syngenesia signify? How many stamens have the flowers of this class? Are the anthers distinct or not? What other distinctive characters has this class besides those just mentioned? What is said of the extent of this class? What is the capitum or head of a compound flower? What is the involucre of a compound flower? When is the calyx monophyllous? When is the calyx imbricated, and when calyculate? What is the receptacle of a compound flower?

Fig. 191. The corolla is placed on the top of the ovary, or germen. It is either funnel shaped with the upper part divided into five, or sometimes, four parts, in which case the florets are denominated *tubular*, as shown in Fig. 191, or it is split on one side, and spread open, in the form of a strap, in



which case the florets are called *ligulate*, as shown in the right hand figure; or it is divided into two portions, of which one is larger than the other, when it is called *bilabiate*, or two lipped.

The *stamens* are attached to the inside of the corolla, just below the mouth, or limb. Their *filaments* are usually, but not always distinct; their *anthers* are adherent by their edges, and furnished with little membranous appendages at the tip.

The *style* of the *pistil* is filiform, or thread-like, and at its upper summit is split into two linear spreading parts, which are the *stigmas*; or the whole pistil consists of a single piece from the base to the summit, the summit being the stigma.

The florets in this class are either, 1st, *perfect*, having stamens and styles; 2d, *barren*, or *staminate*, having only stamens; 3d, *fertile*, or *pistillate*, having pistils only; or 4th *neutral*, that is, are destitute, of either stamens or styles. The several orders are distinguished by the above named circumstances.

Order 1.—*Syngenesia aequalis*. In this order the florets are all perfect, containing both stamens and styles.

Order 2.—*Syngenesia superflua*. In this, the florets of the disk, or centre are perfect, while those of the margin, or ray, contain only pistils.

Order 3.—*Syngenesia frustranea*. Here the florets of the disk are perfect, those of the ray being neutral, that is, having neither pistils nor stamens.

Order 4.—*Syngenesia necessaria*. In this the florets of the disk have stamens, but no pistils, while those of the ray have pistils but no stamens.

Order 5.—*Syngenesia segregata*. In this the florets are all perfect like those of the first order, but it differs from

When is the corolla of a floret said to be tubular? When is the floret called ligulate? When bilabiate? Where are the stamens attached in this class? How are the stigmas formed in this class? When are the florets, or flowers said to be perfect? When barren? When are the florets, or flowers fertile? When neutral?

that order in having a partial perianth to each floret. In all the other plants of this class the florets are destitute of any thing like a distinct calyx.

ORDER I.—SYNGENESIA *ÆQUALIS*.

Flowers of the disk and ray all perfect.

Æqualis signifies *equal*, in reference to the presence of both pistils and stamens by which this order is distinguished. It is commonly divided into sections, as A, B, and C.

A. Florets all ligulate. Ex. Lettuce, Dandelion.

B. Flowers in heads. Ex. Burdock, Thistle.

C. Florets tubular, forming a disk without rays. Ex. Bone-set, (*Eupatorium*.)

GENUS *Tragopogon*. Goat's beard. Name from *tragos*, a goat, and *pogon*, a beard. Salsify, (*Tragopogon porrifolius*), is the only one of this species that is useful. It has a long, tapering, small, white root, which has the taste of oysters, and hence is called the *vegetable oyster*. It is a biennial garden plant, bearing a purple flower, and is cultivated precisely in the same manner as the parsnip and carrot. In the fall, the roots being first boiled, and then mixed with batter and fried, form a dish much like oyster fritters in taste.

To this order belong Lettuce, (*Lactuca*,) Thistle, (*Carduus*,) Horse Thistle, (*Cnicus*,) Burdock, (*Arctium*,) and a great variety of other common plants which it is unnecessary to specify.

GENUS *Lactuca*. Lettuce. Name from *lac*, milk, on account of the milky juice, which flows copiously when any part of the plant is cut.

Common Lettuce, (*Lactuca sativa*), is the best known and most universal of all salads. Like many other favorite domestic plants its native country is unknown. The garden species is supposed, however, to have come from the *Lactuca virosa*, a poisonous plant, and to have been changed to its edible state by cultivation. All the species contain more or less of the narcotic property, and if the milky juice of the garden kinds be collected and dried, it forms

What is the character of the first order? What distinguishes the florets of the section A? And what plants are examples? How is section B distinguished? How is section C distinguished? And what are the examples? What is said of the genus *Tragopogon*? What is the botanical name of lettuce, and whence does it derive its name?

tolerable opium, (called *Lactucarium*;) hence those who eat much Lettuce become dull and sleepy.

GENUS *Hieracium*. Hawk-weed. This name comes from the absurd belief formerly entertained, that birds of prey made use of the juice of this plant to assist their vision; hence the name, from the Greek *ierax*, which signifies hawk. It is an extensive genus of plants, some of the species being found in nearly every known temperate climate. In this country we have many species, of which the veiny leaved, (*Hieracium venosum*,) is among the prettiest. The leaves are radical, spreading on the ground, shape narrow obovate, entire, ciliated and elegantly variegated with dark red veins. Scape erect, slender, of a dark brown color, and furnished with a few scattering leaves; flowers in a yellow panicle. Grows upon dry hills.

GENUS *Cynara*. Artichoke. Name, said to be from the Greek *kuon*, a dog, because the hard spines of the involucre resemble the teeth of that animal. This genus very much resembles some of the thistles in appearance, and indeed they both belong to the same natural family. Two or three species are cultivated for culinary purposes. That called the *Globe Artichoke*, is a variety of the garden kind, (*Cynara scolymus*,) and grows six or eight feet high, bearing a purple flower. It is a plant of a very striking appearance, and being armed at all points, seems to bid defiance to any common assault. The eatable parts are the lower portion of the leaves of the calyx; also, the fleshy receptacle of the flower, freed from its bristles and seed down, and sometimes the central leaf stalk in a blanched state. These parts being boiled and dipped in melted butter, are ready for the palate. These plants in our climate require to be covered during the winter with straw, and if well treated with manure will last five or six years. The heads appear in June.

ORDER II.—SYNGENESIA SUPERFLUA.

The florets of the *disk* are furnished with both stamens and pistils; those of the *margin* or *ray* with pistils only. The pistils of the *ray* therefore would seem to be superfluous, because those of the *disk* are perfect without them, and hence the name of the order *Superflua*, that is, superfluous.

Whence does *hieracium* derive its name? What is said of the artichoke? What are the characteristics of the order *Superflua*? Why is this order named *Superflua*?

GENUS *Artemisia*. Wormwood. Name from *Artemis*, one of the appellations of Ciana, or as Pliny says, from *Artemisia*, queen of Mausolus, king of Caria. Of this genus there are sixty or seventy species, one only of which, the common Wormwood, (*Artemisia absinthium*,) is considered of much use. This herb is bitter to a proverb, and exceedingly disagreeable to the taste; hence its specific name, *absinthium*, which signifies unpleasant. It is, however, sometimes employed in medicine as a tonic.

GENUS *Aster*. Starwort. The name signifies a *star*, because the numerous rays, or petals of this genus, around the circumference, resemble a star. It is a very numerous genus, a great proportion of which are North American plants. The species rise from a few inches to eight or ten feet high. In England they are called Christmas Daisies, in allusion to their late flowering, which in this country takes place chiefly from July to October and November. The botanical student will find an abundance of these flowers in all parts of North America, in their season. Their colors are purple, red, blue, white, lilac, &c. They are found by road sides, in open fields, and in woods. The New England *Aster* is one of the most conspicuous species. The stem is five or six feet high, flowers large, dark purple, terminal and in large clusters. Grows by road sides, and flowers in September.

GENUS *Solidago*. Golden rod. Name, from the Latin *solidari*, to unite, in allusion to the supposed healing property of some of the species. The species are numerous, and all consist of coarse looking, herbaceous plants, with yellow flowers. With the exception of a few species, the whole genus are natives of North America. They are to be seen every where by the sides of fences in August, September and October, rising from two to six or eight feet high, with dense terminal racemes of yellow flowers. One species known under the name of Golden rod, (*Solidago odora*,) differs from the others, in having linear, lanceolate leaves, which are smooth on the surface, with rough edges, and in possessing a delightful fragrance, partaking of that of anise, and sassafras. The essential oil of this species is employed, when diluted, as a carminative remedy. It

What is the scientific name of wormwood, and whence does it derive its name? Whence does the genus *Aster* derive its name? What is said of the American asters? What is the derivation of the word *solidago*? What is said of the genus as a whole?

grows in low grounds, generally in the woods. The racemes of many of the species are one sided.

GENUS *Dahlia*. Name, in honor of Andrew Dahl, a Swedish botanist, and pupil of Linnæus. This is a small genus of very showy, and easily cultivated plants. They are general favorites, not only on account of their fine appearance, but also because they are in full flower, when most of the beauties of the garden are out of season. This genus came originally from Mexico, and we believe, consists of only two species, though the varieties produced by cultivation, are almost endless. They may be propagated by cuttings, either from the young shoots, early in the summer, or from the shoot roots in the spring. Any number of varieties of the single kinds may be produced by sowing their seeds.

GENUS *Chrysanthemum*. Name from the Greek, *chrusos*, gold, and *anthos*, a flower, because several of the species bear flowers of a golden yellow. The species of this genus are numerous, and the cultivated varieties are forty or fifty in number. It is a popular flower in China, whence most of the varieties now so fashionable in England and America have been derived. They are hardy green-house plants, which flower in thick heads of various colors, chiefly in the months of November, December and January. These plants may be propagated by cuttings taken from the side branches at any season, from April to September. The same may be done by suckers.

ORDER III.—SYNGENESIA FRUSTRANEA.

In this order the florets of the *disk* have both stamens and pistils like those of the last order, but in that, the florets of the *ray* have pistils only, while in this, those of the *ray* have neither stamens nor pistils, and hence the name *Frustranea*, which signifies vain, or ineffectual. The order embraces many showy genera, several of which are cultivated and highly esteemed as ornamental flowers. Such are the Sun flower, *Rudbeckia*, *Coreopsis*, *Centaurea*, and others.

GENUS *Helianthus*. Sun flower. Name, from the Greek *elios*, the sun, and *anthos*, a flower. "Nothing can be a

Whence does the genus *Dahlia* derive its name? From what country was this genus derived? How may the *dahlia* be propagated? How does the genus *Chrysanthemum* derive its name? How does the order *Frustranea* differ from *superflua*?

more complete ideal representative of the sun than the gigantic Sun flower with its golden rays; it is dedicated with great propriety to the sun, which it never ceases to adore, (by turning its disk towards him,) while the earth is illuminated by his light; when he sinks into the west, the flowers of the *Helianthus* are turned towards him; and when he rises in the east, the flowers are again ready to be cherished by the first influence of his beams."—*Ency. Plants.*

That one of the most elaborate scientific works of the age, written or edited, by one of the most learned botanists living, should contain a repetition of this vulgar, but long ago exploded error, is really unaccountable. Nearly all plants incline towards the light, and many flowers, to a certain degree, turn their disks with the sun; but whoever has taken notice of the "gigantic Sun flower" in this respect, knows, certainly, that this is an exception, and that if the several flowers on the same, or on different plants, be examined at any hour in the day, their disks will be found facing in all directions, indiscriminately. Gerard, an old English writer, exposed this error so long ago as 1597: "The flower of the Sunne," says he "is called in Latine *Flos Solis*, taking that name from those who have reported it to turne with the sunne, the which I could never observe although I have endeavored to finde out the truth of it; but I rather thinke it was so called because it doth resemble the radiant beames of the sunne, whereupon some have called it *Corona Solis*, and *Sol Indianus*, the Indian Sun flower." Gerard is probably right with respect to the name of this flower, and certainly so with respect to its *turning with the sunne*.

Of this genus, which contains many species, the gigantic Sun flower, (*Helianthus giganteus*,) is the largest and best known. It is planted as an ornamental border flower, and often attains the height of fifteen feet. Were it a rare and costly plant, it would be highly valued for its uncommon beauty, and indeed common as it is, there are few annual flowers which rival it in symmetry of coloring, and none which our climate affords, in gigantic magnificence.

The Jerusalem Artichoke, (*Helianthus tuberosa*,) is a smaller species, with a tuberous root. This, before the discovery of the potato, was extensively raised as an article

What is said of the sun flower's turning with the sun?

of food, and at the present day is grown in some parts of the world, as a substitute for that root.

The genus *Coreopsis*, and the very extensive one, *Centaurea*, (*Centaury*), belong here. The latter contains some handsome garden flowers, and one or two medicinal plants.

ORDER IV.—SYNGENESIA NECESSARIA.

In this order the florets of the *disk* are furnished with stamens, but have no pistils, while those of the *ray* have pistils, but no stamens; hence the name *Necessaria*, because to perfect the seed, these two organs, the stamens and pistils, are necessary to each other. This order is nearly barren of interesting species. The most conspicuous genera are the Marygold, (*Calendula*), the Ragwort, (*Othonna*), and the Cotton Rose, (*Filago*).

ORDER V.—SYNGENESIA SEGREGATA.

In this order the florets contain both pistils and stamens, but contrary to the other orders each floret has its own calyx, or perianth *separate* from the general, or common calyx, which only is found in the other orders; hence the name, *Segregata*, which means separated. This is a small order, and contains no plants of any importance. Elephant's Foot, (*Elephantopus*), and Globe Thistle, (*Echinops*), are the principal genera. One species of the former, (*E. Carolinianus*), is the only plant of this order contained on the catalogues of American plants.

CLASS XX.—GYNANDRIA. Orders 3.

Fig. T. The name of this class signifies *pistils* and *stamens*, in reference to their both growing together. The stamens are placed on the pistils, or germen.



"The singular plants," says Enc. Plants, "which constitute this class, are distinguished from all others by the anomalous structure of their flowers. These do not, as is usually the case, contain a certain number of stamens surrounding a central ovary, [germen,] or style, but on the contrary, are furnished with a solitary, fleshy, undivided process, round which the sepals,

In the order *Necessaria*, which of the florets contain stamens, and which contain pistils? What are the characters of the order *Segregata*? What does the word *gynandria* signify?

(leaves of the calyx,) radiate, and which supplies the place of stamens and style. The nature of this process has been variously explained; the modern opinion is, that it is formed by the accretion of the stamens and style into a single mass, and this opinion seems to be confirmed by analysis and analogy." "The central process called the column, is understood to be formed by the filaments of three stamens, surrounding a style, and by mutual accretion firmly united with it, and with each other into a solid mass. Of these three stamens it most frequently happens that the *two lateral* ones are sterile, and not furnished with the vestige of an anthera." This, however, is not always the case, for in the Ladies' Slipper, (*Cypripedium*,) the two lateral stamens are fertile, while the central one is barren. Such is the organization in this class, that it is difficult to see how the pollen reaches the stigma, and consequently how the seeds are perfected, especially in the orchis tribe.

Gynandrous plants are among the most interesting vegetable productions of the globe, whether we consider the vivacity of their colors, or the singularity of their organization, or the grotesque appearance of their roots, or the delicious perfume of their flowers. These plants are widely distributed, and in temperate countries are chiefly found in meadows and pastures, among grass; but in tropical countries they often constitute the chief beauty of the forest, being parasites, and occupying the forked branches of trees.

ORDER I.—MONANDRIA. *Stamen* 1.

This order has been divided into several parts, the divisions being founded on the situation of the anthers, and the form of the pollen. It contains most of the plants in the class.

DIVISION 1.—*Anther terminal, erect. Pollen granular, cohering by an elastic ring.*

GENUS *Orchis*. This is the Greek name of the plant. The genus has a ringent corolla. Lip spurred on the under side at the base; anther terminal, adhering. It is a curious and beautiful tribe, many species of which are found in New England. The Fimbriated kind, (*Orchis fimbriata*.)

What is the appearance of the part in the class Gynandria, which answers to the stamens in the other classes? What is the definition of the 1st division in the 1st order of the class Gynandria? What plants belong to this division?

grows in our meadows, and rises to the height of two feet; leaves broad lanceolate; flowers in a spike, each with five spreading petals; color purple; germs incurved and thickened in the middle; spur filiform and longer than the germ.

The root of this genus is singular. Each stalk has attached to it two bulbs, or tubers, one of which is withered, and the other plump. The withered one has produced the growing plant, while the other is destined to be its successor the next year. The centre of the new bulb being about an inch from the old one, the plant travels about that distance every year, so that in a dozen years it will be found to have marched a foot from its former place. It is from certain species of this genus that the preparation called *salep* is made. This is a white powder, similar in its qualities to Sago and Arrow-root. Brown has placed most American Orchideæ under his new genus *Habernaria*.

DIVISION II.—*Anther parallel with the stigma. Pollen powdery.*

GENUS *Neottia*. Ladies' tresses. The name is Greek, and signifies bird's nest. How it obtained its popular name in this country is unknown. One species, (*Neottia pubescens*.) is called *Rattle Snake Plantain*, from the singular, reticulated appearance of its leaves. This grows in dry places in the woods, where its leaves may be found in March, forming a kind of whorl, and lying flat on the ground. Color green, veined with white, with a lustre like velvet. The stem rises afterwards to the height of a foot and produces a spike of white flowers. This plant is so fond of its native woods, that it refuses domestic culture.

DIVISION III.—*Anther terminal, persistent. Pollen powdery.*

GENUS *Arethusa*. Arethusa was a nymph of Diana, and Fig. 193. as the poets feigned, was transformed into a fountain. The species are found in moist places. *Arethusa bulbosa* is a native of our meadows. Stem a foot high, and in small plants leafless; in larger ones a few lanceolate leaves appear on its upper part. Flower single, petals blue, and all on one side, forming a kind of head. Style large, incurved like the petals, and supporting its anther near the end. It is a beautiful little flower, and will be known by the adjoining figure, 193.



DIVISION IV.—*Anther terminal; moveable, and deciduous.*
Pollen vary.

GENUS *Cymbidium*. Name from the Greek, signifying a little boat, in allusion to the form of the labellum, or front segment of the flower. The tuberous *Cymbidium* is found in our meadows, and rises to the height of a foot or more. Root bulbous; stem erect, sheathed at the base, and having a single grass-like leaf. Flowers purple, with five spreading petals; inflorescence, a spike. Style concave, and supporting a terminal anther. This is a singular, and fine looking plant.

ORDER II.—**DIANDRIA.** *Stamens 2.*

GENUS *Cypripedium*. Ladies' Slipper. Name, from *kypri*, Venus, and *podion*, a slipper, in allusion to the slipper-like form of the labellum, or principal segment of the flower, which is commonly called the *nectary*.

The common species, (*Cypripedium calceolus*.) is a well known garden flower. There are also several wild species growing in our woods, and of these the *Cypripedium humile* is among the most beautiful. This singular species grows in the distant woods, seldom being found near the habitations of man. Dr. Bigelow describes it thus: "The present species differs from the rest in having no stem leaves. The leaves are two, springing from the root, large, oval-lanceolate, plaited, downy. Flower commonly single, terminal, nodding. Petals four, spreading, the two lateral ones narrower, and somewhat twisted. Nectary a large purple, inflated bag, veined, villous, and longer than the petals. Style, over the base of the nectary, supporting two lateral anthers on the inside, and ending in a broad, roundish, deflected, acute lobe, carinated on the inside." Flowers in May and June.

ORDER III.—**HEXANDRIA.** *Stamens 6.*

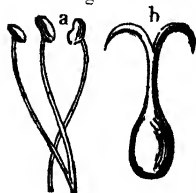
GENUS *Aristolochia*. Birthwort. This genus contains a number of medicinal species, among which is Snake root, (*Aristolochia serpentaria*.) This root is said to be the substance which the Egyptian snake jugglers chew for the purpose of stupifying their reptiles, by spitting in their mouths. The species is a native of this country and is much employed as a tonic in medicine, both at home and abroad. The

What is the definition of the 4th division of this order?

stem is slender, and 8 or 10 inches high ; leaves cordate, oblong, acuminate; peduncles radical; lip of the corolla lanceolate. The root has a bitter taste, and an aromatic smell. The flower is inflated and purple. Grows in woods.

CLASS XXI.—MONŒCIA. Orders 8.

Fig. U.



The name of this class is derived from the Greek, *monos*, one, and *oikos*, house, and signifies, in botany, that the stamens and pistils inhabit the same plant. The class is thus distinguished from the next, *Diœcia*, in which the stamens and pistils are on different trees. In the present class, the stamens and pistils, though on the same plant, are in distinct flowers; *a* represents the stamens, and *b* the pistils. In all the classes heretofore described, these parts are in the same flower, and as the influence of the pollen of the stamens is necessary to perfect the seeds of the pistils, the pupil will probably be at a loss to conceive how this influence is exerted, when these parts are at a distance from each other. There is no difficulty in this question. The wisdom of the Creator has not left so important a matter without provision. In many plants, as the trees, the pistillate and staminate flowers are placed indiscriminately on all the branches, so that the pollen falls upon, or is waisted by the wind to the stigmas. In the Cucumber, and Gourd, the pollen is carried by insects, as bees, in search of honey, from one part to the other, and whoever has watched these insects, and observed them covered with the yellow dust, which is the pollen, will have no difficulty in conceiving that an ample quantity may be transported in this manner. Monœcia contains nearly all the important timber trees of temperate countries, such as the *Oak*, *Birch*, *Pine*, *Beech*, *Walnut*, &c. It also contains the *Bread-fruit*, an article of great importance as food in some countries.

Sprengel, and some other botanists, have referred many of the genera of Monœcia to other classes, considering those plants only as belonging here, which have their staminate and pistillate flowers differently constructed. In

What does the word Monœcia signify, and how is this word applied to the situation of the stamens and pistils of this class? In the flowers of this class how is the pollen said to be transmitted from the anthers to the stigma?

some instances, the aments, or parts containing only pistillate flowers, and those containing the staminate ones, are nearly similar in appearance, the only difference being in the shapes of these minute parts. It is by close inspection, only, therefore, that in these instances this important distinction can be ascertained.

The orders depend on the number of stamens.

ORDER I.—MONANDRIA. *Stamen 1.*

GENUS *Artocarpus*. Bread Fruit. Name from *artos*, bread, and *karpus*, fruit, in allusion to the use of this fruit as a substitute for bread. The true Bread Fruit, (*Artocarpus incisa*,) grows on a tree about 30 feet high. The leaves are large, being two feet long and about 18 inches wide. They are pinnatifid, and deeply gashed. The fruit is about the shape and size of a child's head, with a rough net-like surface; the skin is thin, and it has a small core at the centre; the eatable part lies between the skin and core; this is nearly as white as snow, and somewhat of the consistence of new bread. It is eaten roasted, and is said to taste like wheat bread, mixed with Jerusalem Artichoke. This tree is distributed very extensively over the Eastern continent, and its islands, and is a striking instance of the care which the Creator has taken of man, wherever he may be stationed; for the Bread Fruit is often almost the only food, on which the inhabitants of some of these islands live.

ORDER II.—DIANDRIA. *Stamens 2.*

GENUS *Lemna*. Duck Meat. Name from the Greek, signifying a scale, in allusion to the form and size of this plant. Lesser Duck Meat, (*Lemna minor*,) is found in the form of small floating scales, on the surface of stagnant pools of water. These scales, which are the leaves of the plant, produce minute white flowers from a fissure in their margins. They adhere, two or three together, by their edges, and send down thread-like roots into the mud below. These minute plants often cover the entire surfaces of stagnant ponds. It is said that ducks are fond of eating it.

ORDER III.—TRIANDRIA. *Stamens 3.*

GENUS *Typha*. Cat's Tail. Name from *tuphos*, a marsh, in which all the species naturally grow. This plant ap-

What is said of the importance of the bread fruit as an article of food? What is the size and form of the plant called duck meat?

pears to be a native of nearly every part of the world. The stem is six or eight feet high, straight, and beautifully formed. Leaves sword shaped, and four or five feet long. These are employed by coopers to insure the tightness of their casks, and by others for making chair bottoms, &c. The upper part of the compact spike, or catkin, bears the stamens, or barren flowers, and the lower part the pistils, or fertile ones.

To this order belong the sedges, (*Carex*), a very extensive and widely disseminated genus, but of little use or beauty.

ORDER IV.—TETRANDRIA. *Stamens 4.*

GENUS *Alnus*. Alder. Name from the Celtic words *al*, near, and *lan*, the edge of a river, in reference to the wet places, which this genus prefers. The species are small trees, which form thickets in wet places. Our most common species is the notch leaved Alder, (*Alnus serrulata*;) Fig. 195.



leaves obovate, serrate, and on long petioles. This tree flowers in March, and produces, at first, smooth, pretty looking aments, hanging in clusters of two or three. They afterwards grow lax, and emit a yellow dust, which is the pollen. These are, therefore, the staminate, or barren aments. The fertile ones, which bear the pistils, are shorter, and rigid, forming small cones, which remain on the tree. These parts are represented by Fig. 195. The Beech, Mulberry, Nettle, and Box Tree, belong here.

ORDER V.—PENTANDRIA. *Stamens 5.*

GENUS *Amaranthus*. Amaranth. Name, from the Greek, *a*, and *marino*, signifying *not to wither*, because the flowers of many of the species retain their color and form, when dried. This is a numerous genus, some of which are ornamental, but most of them are common weeds. Prince's Feather, (*Amaranthus hypochondriacus*), and Love-lies-bleeding, (*acudatus*), are common garden species. White, and Tri-colored Coxcomb, are also well known species.

Whence does the genus *Alnus* derive its name? Which are the staminate and which the pistillate parts in Fig. 195? What is the derivation of the word *amaranth*?

ORDER VI.—HEXANDRIA. *Stamens 6.*

GENUS *Cocos*. Cocoa-nut tree. Linnæus derives this name from the Greek, *kokkos*, which signifies a kind of fruit. This is a tree of the palmkind, and there are few trees more extensively or variously employed. The leaves are used to thatch, or cover the roofs of houses, and to make mats either for sitting, or lying upon by the natives of hot climates. Of the leaf, when reduced to fine fibres, is also made beautiful, and costly carpets, while the coarser parts are made into brooms. The tree grows to the height of 50 or 60 feet, and has neither branch nor leaf, except at the



Fig. 196. top, where there is a large tuft of pinnated fronds, as represented by Fig. 196. From the top of the tree, there is produced a large shoot, which, when boiled, is said to resemble broccoli in taste. This bears the flowers and fruit which are represented by Fig. 197. The fruit is a nut, whose husk is of the size of a man's head, and when fully ripe, it falls with the least wind. The shell is hard, oval, and of the size of an ostrich's egg. This is lined with a white pulpy substance, which is hollow, and contains a quantity of liquor, which, when the fruit is young, is clear like water, and more than a pint in quantity. As the fruit grows old, this liquor turns milky, and is gradually absorbed, by the white pulp, until finally none remains. This pulp is used by the natives of hot climates for food, and the liquid makes a beverage of which they are very fond. The Cocoa-nut is grown in the East and West Indies, and is transported to various parts of the world for sale.

ORDER VII.—POLYANDRIA. *Stamens more than 6.*

GENUS *Sagittaria*. Arrow-head. Name, from the Latin, *Sagitta*, an arrow, in reference to the arrow-headed form of the leaves. This is a genus of considerable extent, of which, eight species are natives of North America. Common Arrow-head, (*Sagittaria sagittifolia*,) is frequently to be seen

What is said of the uses of the several parts of the cocoa-nut tree?

by the sides of ponds and rivers, and is the chief ornament of such places. It rises to the height of two or three feet, and bears a close spike of white flowers. Leaves radical, large, distinctly and beautifully arrow-shaped, with very conspicuous veins; scape somewhat triangular; petals three, orbicular, and deciduous. It is perennial.

GENUS *Castanea*. Chestnut. Name, from *Castanea*, a town in Thessaly, where the most magnificent Chestnut trees are still to be seen. It is said that the oldest trees in the world are of this kind. This tree is a native of the new, as well as of the old world, and between them there is no specific difference. Our Chestnut is one of the largest of North American forest trees, growing to the height of 80 or 90 feet. The fruit is so highly esteemed as to be well known in most parts of the world, being an article of commerce.

The Beech, (*Fagus*), Hazle and Filbert, (*Corylus*), and Walnut, (*Juglans*), belong here.

GENUS *Quercus*. Oak. Name, from the Celtic, *quer*, fine, and *cuez*, tree. Of this genus botanists enumerate fifty or sixty species, and many varieties. In North America, according to Dr. Torrey, we have thirty-four species of the Oak. The Black, White, and Red Oak, are well known forest and timber trees. For the construction of machinery requiring strength and durability, White Oak is considered superior to all other American woods.

The Cork tree, (*Quercus suber*), is a member of this family. It is cultivated in Spain, Portugal, and the south of France, for its cork bark. The exterior bark is the cork, which is taken off once in about ten years. There is an interior bark which protects the tree, and which in its turn becomes cork. The tree grows to the height of twenty or thirty feet.

Fig. 198.



The leaves are oblong ovate, entire, and somewhat remotely serrate, and like other Oaks, its fruit is an acorn, Fig. 198. It is said that stripping off the bark, so far from injuring these trees, is the means of increasing their longevity, so that trees which are never barked live only fifty or sixty years,

What is said of the name and age of the chestnut tree? What number of the *Quercus* genus grow in North America? For what purposes is the wood of the oak considered superior to all others? What is the use of the *quercus suber*?

while those which are treated in the usual manner, live a century, or more. The bark is taken off in large sheets from the standing trees, and is flattened by pressure, or by beating the convex side. Both sides are afterwards burned, or charred, in order to close the transverse pores. The effect of this may be seen in large pieces of cork, but not in bottle corks, as they are cut in the longitudinal direction of the bark. Cork has many uses, besides that of forming stoppers. The Greeks made sandals of it, and the Venetian ladies, at one time, wore cork heels to their shoes, so high as to raise their heads above those of the men. Poor people in Spain lay broad plates of it by their bed sides, to defend their feet from the floor, and sometimes they line the inside of their houses with this bark.

GENUS *Arum*. Dragon-root. The origin of this name is doubtful. The genus consists of many species, some of which are tuberous rooted perennials, while others are herbaceous annuals. All of them are singular looking plants. The species best known in this country is the Indian Turnip, (*Arum triphyllum*,) which grows in swamps and damp woods, and flowers in May. The leaves are ternate, or in threes; scape a foot high, supporting a large, curiously formed flower, which is sometimes green, and sometimes elegantly striped. Within the flower, which is a spathe, there is a club shaped spadix, of a dark greenish, or sometimes blackish color. The root is globular, and exceedingly acrid to the taste when green, but becomes mild by drying, or boiling.

ORDER VIII.—MONADELPHIA. *Stamens united into a single body.*

-GENUS *Areca*. Cabbage tree. Name, from *Areec*, which is the Malabar name of this tree, when old. When young, it is called Paynga. This is a tree of the Palm kind, which in the West Indies grows to the height of forty feet. The esculent species, (*Areca oleracea*,) which is the only one growing in the West Indies, produces its edible part on the top of the tree. This consists of the tender leaves before they are unfolded. The sheaths of the leaves are closely pressed together below their expanded, or green parts, forming a white, and nearly solid mass. This being cut off,

How is the cork prepared for use after it is taken from the trees? What is said of the *Arum* genus?

and the inside, or heart taken out, affords a delicious salad, when seasoned with vinegar and pepper, and is eaten in the manner that we eat cabbage slaw. It is also good when fried in butter.

GENUS *Pinus*. Pine. Name, from the Celtic, *pin*, or *pen*, signifying fir-tree. The fir is however a different species, though the two are often confounded. This is among the noblest genera of forest trees. Several of the species rise to the height of 200 feet, and are not less remarkable for their magnificence and beauty, than for the value and durability of their timber. Of this tribe, or natural order, which is called *Conifera*, or cone bearers, Dr. Torrey enumerates thirty-one species as natives of North America. They are all evergreens, and according to Prof. Lindley, are natives of various parts of the world, from the perpetual snows and inhospitable climate of Arctic America, to the hottest regions of the Indian Archipelago. The largest and most valuable, are however chiefly found in the northern and temperate parts of the northern hemisphere.

“No order,” says Prof. Lindley, (*Nat. Sys.*) “is of more universal importance to mankind than this, whether we view it with reference to its timber, or its secretions. Gigantic in size, rapid in growth, noble in aspect, robust in constitution, these trees form a considerable proportion of every wood, or plantation in cultivated countries, and of every forest where nature remains in a savage state.” One species of this tribe, growing in New Zealand, attains the height of 200 feet. But even this is surpassed by some of the pines in North America, which are said to attain the height of 230 feet.

The masts and spars of ships are universally made of the wood of this genus, and a great proportion of the lumber, which is transported from one country to another, is of pine. The resinous secretions of this tribe, are also of the greatest consequence to man, and especially to the interests of commerce. Tar, pitch, and rosin, articles absolutely indispensable in the preparation of ships for sea, all come from these species. Oil of turpentine, Canadian balsam, Balm of Gilead, Venetian turpentine, Storax, and several other useful resins, are the products of the Linnæan genus, *Pinus*.

What is said of the size and use of the pine genus? How has the pine-tree family been divided?

This family has been divided into *Pinus Larix*, (Larches,) and *Abies*, (Firs.) All the species bear cones, which are of various shapes and sizes. These are composed of hard woody scales lying over each other, which disposition appears to be designed to protect the stamens and pistils contained within, or under them.

The different species are distinguished by the disposition of the leaves, and the shape of the cones. In most of the species which are called Firs, the leaves are solitary, or distinct at the base, while in the Pines, they are in pairs, or twins, and are surrounded at the base, by a sheath common to both. Some of the Pines, however, have their leaves in threes, and one or two species in fives, and in two or three of the Firs they are in fours.

The most common species of the Pine genus in this country are the following.

Yellow, or Red Pine, (*Pinus resinosa*.) Leaves in pairs; cones ovate-conical, rounded at the base, solitary, half as long as the leaves, scales unarmed; sixty feet high.

Scrub Pine, (*Pinus Banksiana*.) Leaves in pairs, divaricating and oblique; cones recurved, twisted; scales unarmed; twelve feet high.

Three leaved Yellow Pine, (*Pinus variabilis*.) leaves twin, or ternate; cones ovate-conical, nearly solitary; arms of the scales incurved; forty feet high.

Pitch Pine, (*Pinus rigida*.) Leaves in threes; cones ovate and clustered; sheath of the leaves, short; spines of the scales reflected; eighty feet high.

White Pine, Weymouth Pine, (*Pinus strobus*.) Leaves in fives, and very slender; sheaths short; cones cylindrical, pendant, and longer than the leaves; scales loose; sixty feet high.

Balsam tree. Fir tree, (*Pinus balsamea*.) Leaves solitary, or distinct at the base, glaucous or greyish beneath, flat, and sub-erect above; cones cylindric, erect; bracts short; sixty feet high.

Black Spruce, (*Pinus nigra*.) Leaves solitary, four cornered, erect and straight; cones ovate; scales elliptical, erect and wavy at the edge; fifty feet high.

Hemlock-spruce, (*Pinus Canadensis*.) Leaves solitary, flat, denticulate, and nearly in two rows; cones ovate,

How are the several species of this family distinguished from each other? What are the species of pine most common in this country?

terminal, and scarcely longer than the leaves; eighty feet high.

Black Larch, Hackmatack, (*Pinus pendula*.) Leaves many, in a bundle, deciduous; cones oblong, margins of the scales inflected. The renowned Cedar of Lebanon is a species of Larch.

GENUS *Cucurbita*. Gourd. Name, the Latin word *cucurbita*, which signifies a vessel. This is said to come from the Celtic, *cuce*, a hollow thing.

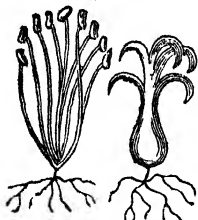
In this well known genus the staminate flowers have a calyx, which is five-toothed, corolla five-cleft; filaments 3. Pistillate flowers, calyx five-toothed, corolla five-cleft, pistil three-cleft. The species include the Gourd, Squash, Pumpkin, and Watermelon, the seeds of which are thickened at the margin.

GENUS *Cucumis*. Cucumber. The name is derived from the source explained above. The flowers are similar to those of the gourd kind, but the seeds are sharp edged, and the fruit is quite different. The Muskmelon also belongs here.

CLASS XXII.—DICECIA. Orders 13.

Flowers containing the stamens on one tree, and those containing the pistils on another tree.

Fig. V.



The name of this class is derived from the Greek, *dis*, twice, and *oikos*, a house, in reference to the stamens and pistils being on two distinct plants. This class contains a considerable number of important genera, the most extensive of which is the *Salix*, or Willow. The Poplar, Juniper, Nutmeg, Yew-tree, Hop, Hemp, Date, Palm, and Pitcher plant are also Dicecious plants.

The difference between the plants which bear the stamens, and those containing the pistils, is not commonly obvious except by close inspection of the flowers of each. In some instances, however, there is a difference in the size,

In the gourd family what is the difference between staminate and pistillate flowers? What does the denomination of the class Dicecia signify? In what respects do the plants of this class differ from those of Monœcia? In the willow how may the barren aments be distinguished from the fertile ones?

or shape of the staminate, and pistillate aments or flowers. By comparing these parts from different trees, the pupil will soon be able to distinguish the difference, and to determine which tree will bear fruit, and which not. In the *Salix*, or Willow, for instance, each ament contains many stamens, or pistils, the scales of which the ament is chiefly formed, serving as calyxes to each individual flower.

In the staminate or barren florets, there are from one to five stamens, with a nectariferous gland at the base. In the pistillate or fertile florets there are two stigmas.

These flowers have neither corolla nor perianth. The staminate aments may readily be distinguished in some of the species, by the yellow anthers, which are elevated by their filaments considerably above the scales of the ament. In the Swamp Willow, (*Salix eriocephala*), a small tree growing in wet places, the erect, downy aments are very conspicuous in the early spring. In this species the fertile aments are the longest, and may also be known by their wanting the yellow anthers which distinguish the barren trees.

In this class the orders are distinguished by the number and situation of the stamens.

ORDER I.—MONANDRIA. *Stamen* 1.

GENUS *Pandanus*. Screw-Pine. Name from the Malay *Pandang*, by which word this tree is known. Its common name appears to have come from the direction of the grain of the bark, which runs around the body of the tree, instead of lengthwise, as is usual.

The species *Odoratissimus* is a large spreading bush, and is cultivated in Japan on account of its perfume, which of all perfumes is said to be the richest, most powerful, and most delightful. Of the leaves of this tree, the Sandwich Islanders make their finest and most beautiful mats.

ORDER II.—DIANDRIA. *Stamens* 2.

GENUS *Salix*. Willow. Name, from the Celtic, *sal*, near, and *lis*, water. This is a very large and widely diffused genus. It grows in nearly every climate and soil, some of its species inhabiting Lapland, and Siberia, while others are found in the East Indies, and the Levant. Thirty-five

How are the orders of this class distinguished? Are the willows confined to any particular climate or not?

species are natives of North America.—(*Torrey*.) Besides which we have several exotic species, and among them the Weeping Willow, (*Salix Babylonica*.) This is a native of the East, and was introduced into England from the Levant in 1692, and from England to America. It has been said that the celebrated Pope introduced this tree into England, but this appears to be a mistake, since he was only a few years old at the time of its introduction. The celebrated specimen of this tree which stood in the poet's garden at Twickenham, was a cutting from some rods employed in a package which came from Spain. Pope being present when the package was opened, observed that one of the rods was still green, and under the impression that it might produce something new in England, planted it in his garden. From this came Pope's famous willow, so often mentioned by travellers, and which, though it has given rise to many others, is not the parent tree of all the others, nor was it the first in that country.—*Encyc. of Plants*.

The Yellow Willow, (*Salix vitellina*,) is a native of Europe, though so generally disseminated as often to be thought an indigenous tree. It is believed that we have only the pistillate tree in this country, and hence the Willow can only be cultivated from the roots, or by layers.

ORDER III.—TRIANDRIA. *Stamens 3.*

GENUS *Phoenix*. Date Palm. Phœnix is the Greek name for the Date, probably from Phœnicia, whence the best kinds were brought. The common Date Palm, (*Phoenix dactylifera*,) is a lofty tree of the Palm kind, which grows in the Levant, and East Indies. The Date is a stone fruit, which, being dried, is sent to most parts of the world. In Arabia and Persia this fruit makes a considerable part of the food of the poorer classes, and the stones are ground into provender for their camels.

ORDER IV.—TETRANDRIA. *Stamens 4.*

GENUS *Myrica*. Candleberry. Myrtle. Name from the Greek *muro*, to flow, because these plants grow on the banks of rivers. There are several species of this genus growing in different parts of this country. The Bayberry, (*Myrica cerifera*,) produces the substance called bayberry tallow. This shrub or bush grows four or five feet high, and produces abundance of grey, hard berries, about the size of allspice. To obtain the tallow, these are picked in

the fall, and thrown into boiling water. The tallow, which is on the outside, being thus melted, rises to the surface and is skimmed off. It is afterwards purified by remelting, when it is of a greenish color, and very hard and heavy. This is sometimes mixed with common tallow to make candles for summer use, and which are not liable to the usual inconveniences of bending, or melting in hot weather.

ORDER V.—PENTANDRIA. *Stamens 5.*

GENUS *Humulus*. Hop. Name from the Latin *humus*, moist, or fresh earth, because the hop will not grow in a poor dry soil. Our word *hop* comes from the Anglo-Saxon *hoppa*n, which signifies to climb.

This plant and its uses are so universally known, as not to require description. The Pepperidge or Tupelo, (*Nyssa villosa*,) and the Prickly Ash, (*Xanthoxylum fraxinum*,) belong here.

ORDER VI.—HEXANDRIA. *Stamens 6.*

GENUS *Smilax*. Name from the Greek, signifying a *grater*, in allusion to the prickles which beset the species. One species of this genus, called Green briar, (*Smilax rotundifolia*,) is a well known, and very troublesome native of our woods and hedges. The stem is small, round, woody, very strong, and of a green color; leaves heart-ovate, and five-nerved; flowers in small umbels on axillary stalks; fruit a bunch of bluish black berries, which remain during the winter. This plant climbs on trees and bushes, and being armed with strong sharp prickles, often forms thickets which are impenetrable to man or beast.

ORDER VII.—OCTANDRIA. *Stamens 8.*

GENUS *Populus*. Poplar. Bullet says, that the Poplar has obtained its name from the motion of its leaves, which are in a perpetual state of agitation like the *populace*. Others say that it comes from *arbor populi*, tree of the people, because the public squares at Rome were planted with it.

The genus consists of ten native, and many foreign species, all of them trees, from 30 to 80, or 90 feet high. The Tacamahack, (*Populus balsamifera*,) a native species, is sometimes a large tree rising to the height of 70 or 80 feet; leaves ovate, acuminate, white, and netted underneath. The buds

Whence is it said the poplar obtained its name?

of this tree are large, and covered with an abundance of yellow, glutinous balsam, which sometimes drops on the ground. In Canada, these buds are collected and the balsam obtained by pressure, for medicinal purposes. The Lombardy Poplar, (*Populus dilatata*), is a native of Italy, and like all other trees of rapid growth, is short lived. These trees, so far as we know, are all staminate, and it is said that the pistillate plant of this species has not been brought to America, hence no fruit from this tree has been produced.

ORDER VIII.—DECANDRIA. *Stamens 10.*

This contains no interesting or common plant.

ORDER IX.—DODECANDRIA. *Stamens 12.*

GENUS *Cocculus*. This is a small tree, which bears a black berry, in bunches like grapes. This being ground and made into paste with flour, is used to intoxicate fish, and birds, so that they may be caught.

ORDER X.—ICOSANDRIA. *Stamens many, inserted on the calyx.*

It contains nothing important.

ORDER XI.—POLYANDRIA. *Stamens many, inserted under the germen.*

This order is also barren of interesting or common native species.

ORDER XII.—MONADELPHIA. *Stamens united into one body.*

GENUS *Ruscus*. Butcher's Broom. This is a genus of small evergreen shrubs, which are curious on account of

Fig. 200.



bearing their flowers and fruit on their leaves, as represented by Fig. 200. The flower, however, does not properly grow out of the leaf, but on a foot stalk of its own, which runs under the outer coat of the leaf, and comes out near its middle. This is ascertained by dissection. The pistillate flowers are succeeded by red berries, nearly the size of cherries, and sweet to the taste. The green shoots of

What is the definition of the order Icosandria? What is the definition of the order Polyandria? What is the definition of the order Monadelphia? What peculiarity does the ruscus, or butcher's broom exhibit?

this plant were formerly used by butchers, to sweep their blocks, whence the common name.

The Juniper, Yew tree, and Nepenthes, or Chinese Pitcher Plant, belong to the present class and order.

GENUS *Myristica*. Nutmeg. Name from the Greek, *murra*, myrrh, on account of its odor. The True Nutmeg, (*Myristica moschata*,) is a tree about thirty feet high, which is cultivated in the East Indies, for its fruit. The tree yields three crops annually. The entire fruit is about the size of a peach, and like it has a furrow on one side. The external covering is smooth, fleshy, and bitter. As this dries it bursts and discloses the next coat, which is the mace of commerce. Within the mace, is inclosed the nut, which is a kernel of a dark brown color, well known under

Fig. 201.

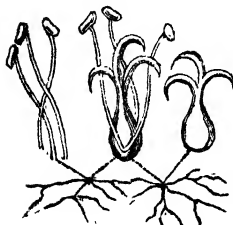


the name of *nutmeg*. The external coat, and the mace, are taken off at the time of gathering the fruit. The mace is dried in the sun, being now and then sprinkled with salt water for its preservation. The nut is exposed to heat and smoke for three months, after which it is thrown into strong lime water, then dried and packed up for sale. All this is said to be necessary for their preservation. The Fig. (201) represents the fruit at the time of gathering, with a small branch of the tree.

CLASS XXIII.—POLYGAMIA. Orders 3.

Flowers either staminate, pistillate, or perfect, upon the same, or on different plants.

Fig. W.



This class differs from the two preceding ones, in having not only the stamens and pistils in different flowers upon the same individual, as in *Monœcia*, or upon separate individuals, as in *Diœcia*, but also, in having these two parts combined in one flower, and mixed with those which are either staminate or pistillate.

This class though still retained by some of the best writers, ought undoubtedly to be dis-

In what manner does the nutmeg grow?

solved, and its genera distributed to other classes. All the genera, with perhaps two or three exceptions, might be thus transferred, without doing any considerable violence to the symmetry of the Linnæan arrangement. Several genera, at present arranged here, are of considerable importance, such as the Ash, (*Fraxinus*,) Maple, (*Acer*,) Sensitive Plant, (*Mimosa*,) &c.

ORDER I.—MONŒCIA.

GENUS *Acacia*. The Greek name for one of the species of this genus. The species resemble those of the genus *Mimosa*, from which they have been separated. *Acacia Arabica* produces the gum Arabic of the shops. This is a low tree with crooked stems, and withered appearance, which grows in most parts of Africa. The gum exudes naturally from the bark, and hardens in the sun. That which comes to Europe and America, is gathered, chiefly, in the Atlas mountains.

GENUS *Acer*. Maple. Name, a Latin word, signifying sharp, or vigorous; probably so called because the heads of war pikes were formerly made of this wood.

This genus contains many species, several of which are well known in most parts of North America. The Sugar Maple, (*Acer saccharinum*,) is a large tree, and is valuable in some parts of our country, on account of its affording sap in the spring of the year, from which sugar is made. A tree of ordinary size yields from twenty to thirty gallons of sap, which produces from five to eight pounds of sugar. This species also affords the beautiful variety, called *bird's eye* Maple, of which cabinet furniture is made.

Red Maple, (*Acer rubrum*,) also called Swamp Maple, is also a large tree, growing in swamps and wet places. The leaves are on long petioles, five-lobed, and serrated. In the flowers which contain both stamens and pistils, the calyx is five parted; the corolla five petalled, the stamens eight, and the styles two. These flowers produce the red samara, or winged seed vessels, so conspicuous on this tree, and which are called *maple keys*. The staminate, or barren flowers, have a five parted calyx, five petals, and eight stamens, like the others, but have no pistils, and hence produce no fruit.

How does the class Polygamia differ from Monœcia and Dioœcia? From what plant and in what manner is gum arabic produced? What is said of the *Acer*, or maple genus?

The wood of this species is heavy and close grained, and is in general use for chairs, tables, &c. The *curled maple*, so much esteemed in cabinet work, for its waved or shaded surface when polished, is a variety of this species.

ORDER II.—DIECIA.

GENUS *Fraxinus*. Ash tree. Name, from the Greek, *phraxis*, a separation, in allusion to the facility with which this wood splits. The English name comes from the Celtic, *æsc*, a pike, because the shafts of pikes were made of this wood. The genus contains thirty or forty species, and several varieties. In North America we have nine species, among which the White Ash, (*Fraxinus Americanus*,) is the most valuable. This tree grows to the height of eighty or ninety feet; stem straight; branches opposite, and bark of a light ash color. In the perfect flowers the calyx is four parted; corolla four petalled; stamens two; pistil one; samara one seeded. In the pistillate flowers, which are on a distinct tree, the stamens are wanting; in other respects they are as above described.

GENUS *Ficus*. Fig. Ficus is the Latin name of this plant. The genus embraces about fifty species, all natives of warm climates, and many of them differing from each other in nearly every respect. The flowering of this genus is quite peculiar. The green fruit is a hollow calyx, or receptacle, in which the flowers are contained. In most of the species the stamens and pistils are on different plants, and the seeds, therefore, could not be perfected in any of the species, were it not for the help of certain minute flies, which in their search for honey carry the pollen from the anthers of one flower to the stigmas of another. This wonderful provision displays at once the care and beneficence of the Creator; for while on the one hand it insures the perpetuity of several plants of great importance to man, on the other, it allows the pleasures of existence to a tribe of insects which appear to be designed for this very purpose.

Fig. 203.



The figure, 203, represents the section of a common fig in its green state, showing the situation of its flowers. As the fruit grows, this cavity is pushed outwards, or filled up, so that when ripe, no remains of it are visible.

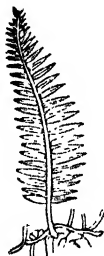
The common Fig, (*Ficus carica*,) and one other species, have three, or five lobed leaves;

but in most, if not all the other members of the genus, these organs are entire, and oblong lanceolate or ovate.

The Banyan tree, (*Ficus Indica*), which has already been described and figured, and the Gum Elastic tree, (*Ficus elastica*), are species of this genus. The latter grows to the height of twenty feet; leaves smooth, entire, very large, thick and shining; shape oblong lanceolate; stem branched; bark smooth and light ash colored. The tree is remarkably beautiful. The gum is obtained by making incisions through the bark, and at the present day is an article of great commercial interest in South America. The overshoes and bottles of this substance, are formed by spreading the gum as it comes from the tree, on properly shaped pieces of clay, coat after coat being applied, until the required thickness is attained: the clay is then crushed, and poured out, and these articles remain in the state in which we see them.

CLASS XXIV.—CRYPTOGAMIA. Orders 8.

In this class the stamens and pistils are either hidden, imperfect, or wanting.



Cryptogamous plants differ essentially from any of those we have formerly described. The number, or situation of the stamens and pistils, which heretofore have been our guides in the arrangement of the classes and orders, cannot be here employed for this purpose, since these organs in some cases are concealed, in others very minute, and in

From what circumstance does the *fraxinus* derive its name? In what respect is the flowering of the *Ficus* genus peculiar? What is the genus and form of the tree which produces the gum elastic? How do plants of the class Cryptogamia differ from other plants?

others apparently wanting entirely. This class has therefore been distinguished by late writers under the name of *Flowerless Plants*.

The class is divided into eight orders, or tribes, viz. 1. **FILICES**, (*Ferns*,) 2. **EQUISETACEÆ**, (*Horse tails*,) 3. **LYCOPODINÆ**, (*Club-mosses*,) 4. **MUSCI**, (*Mosses*,) 5. **HEPATICÆ**, (*Liverworts*,) 6. **ALGÆ**, (*Flags*,) 7. **LICHENS**, (*Rock Mosses*,) 8. **FUNGI**, (*Mushrooms*,)

These divisions will be explained and illustrated in their turn; but we must first explain a few terms which are employed only in describing plants of this class, and which therefore have not been heretofore used.

Sori, patches of fructification on the back of the fronds, or leaves of Ferns.

Sporules, the seeds of flowerless plants, or rather the parts of these plants which answer to the seeds of other plants.

Thecæ, the cases which contain the sporules of Cryptogamic plants, answering to the seed vessels of other plants.

Gregarious, herding together, as when the stipes of several Mushrooms spring from the same place.

Calyptra, literally an extinguisher; applied to the body which tips the thecæ of the Mosses.

Indusium, the membrane that encloses the thecæ of Ferns.

Cap, the head or spreading part of Mushrooms.

Gills, the lamella, or thin vertical divisions on the under side of the caps of Mushrooms.

ORDER I.—FILICES. *Ferns*.

In this order the fruit is mostly placed on the back of the frond; the thecæ are naked. When young, the fronds are *circinate*, or curled.

The principal distinction which exists between Ferns and other flowerless plants, is found in the situation of their sori, or patches of sporules, which in most cases are inserted on the back of the frond. Sometimes they appear only in the form of little spots, and sometimes they cover the whole under surface, contracting the leaf, and giving it the appearance of one mass of fructification. The thecæ, or patches of sori, are surrounded by elastic rings, which in some spe-

What are sori? What are sporules? What are the thecæ of Cryptogamous plants? When are plants said to be gregarious? What are calyptra? What is meant by indusium? What part of a mushroom is the cap? and what part the gills? On what part of the plant do the ferns bear their fruit?

cies burst as they become dry, and throw the sporules, or seeds, in all directions, in the form of fine dust. This may be observed by placing a frond on a sheet of white paper, as heretofore noticed. Many plants of this order are found in our woods, and are known under the names of Polypody, (*Polypodium*,) Brake, (*Pteris*,) Spleenwort, (*Asplenium*,) Shield Fern, (*Aspidium*,) &c.

GENUS *Polypodium*. Polypody. Name from the Greek, signifying *many*, and *foot*, in allusion to its multitude of roots. The genus consists of many species, some of them noble plants, growing from three to five feet high.

Fig. 207.



The common Polypody, (*Polypodium vulgare*,) is a handsome Fern, which is common among rocks, and in shady places; fronds deeply pinnatifid, and about a foot long; stipes smooth and grooved on the upper side; sori naked and solitary; leaflets, or segments of the frond, slightly serrate, and gradually shorter towards the upper end, as in Fig. 207. This plant is common to Europe and N. America.

GENUS *Osmunda*. Flowering Fern. Name from *Osmunda*, a Celtic divinity, the representative of force, because this plant was supposed to have potent qualities as a medicine. Three species of this genus are found in our woods, often growing together. Tall, or Woolly Osmunda, (*Osmunda cinnamomea*,) is a noble Fern, growing three or four feet high. "The fertile frond is covered with a substance resembling wool, of a cinnamon color, from which it derives its specific name. The little seed vessels of the Osmunda genus, when examined by a microscope, are seen to be half bivalved, or resemble in form a sleigh bell."

GENUS *Ophioglossum*. Adder's tongue. Name from Fig. 208. the Greek *ophis*, a serpent, and *glosse*, a tongue.



Common Adder's tongue, (*Ophioglossum vulgatum*,) is a little neat looking plant with an ovate frond, consisting of one green lanceolate simple leaf, from the base of which there grows a stipe, bearing the fruit in a kind of spike. The whole plant is only two or three inches high, and differs widely in appearance from all its associates. It is well represented by Fig. 208.

This genus differs from the proper Ferns in bearing its fruit on a jointed spike instead of on the back of the frond.

• ORDER II.—EQUISETACEÆ. *Horsetails.*

This order contains only a single genus, viz. *Equisetum*, (*Horsetail*), of which there are numerous species, all resembling each other in habit and appearance. Five or six of these are North American plants, most of which grow in damp places, about the borders of woods, and on the banks of streams.

Fig. 209.



Scouring rush, (*Equisetum hyemale*), is the only useful species. The stem is without leaves, erect, straight, hollow, and furrowed, the ridges being cut into minute teeth. The joints of the stem are furnished with short sheaths, or rings, colored black and white. The fruit grows in a terminal spike, or ament. This plant is in common use for scouring wood, and polishing metals. The outer rough bark or cuticle contains a quantity of siliceous matter, or flint, and hence it will scratch the hardest steel. The plant is about two feet high, and a little larger than a pipe stem.

ORDER III.—LYCOPODINEÆ. *Club-Mosses.*

In this order the reproductive organs are axillary, sometimes apparently spiked, thecae of two kinds, the one containing minute grains, the other larger bodies. The stems are covered with many small leaves.

These are chiefly small moss-like plants, with creeping stems, and imbricated or scaly leaves. A few are without stems, having awl-shaped leaves, and a solid bulb-like root, called a *caudex*. Many of them are evergreen plants, and some thrive very well as ornamental dressings for flower pots.

GENUS *Lycopodium*. Club-Moss. Name from the Greek, *lukos*, a wolf, and *pous*, a foot, in allusion to the shape of the root, which is said to resemble a wolf's foot. The species are very neat, deep green, little evergreen plants, growing plentifully in our woods. They are best known under the name of *ground pines*, and several of them are

What useful plant belongs to the genus *Equisetaceæ*? What kind of plants are the club-mosses?

well known as Christmas decorations for churches and houses.

Fig. 210.



The Arbor-vitæ leaved, or Flat Club-Moss, (*Lycopodium complanatum*,) Fig. 210, creeps under the leaves of the woods, now and then sending up erect stems, which are forked, partly naked, and terminated by short yellowish spikes. The leaves are short and acute, two-rowed, connate, or united, and green all the year.

One of the prettiest species of this genus is the Glittering Club-Moss, (*Lycopodium lucidulum*,) This grows about four inches high; leaves in eight rows, linear lanceolate, acute, and reflected; stem forked, erect, and without a spike, the fruit being contained in a kind of calyx on its side.

ORDER IV.—MUSCI. Mosses.

The Mosses are dry herbs, furnished with distinct leaves and stems. They are distinguished from other flowerless plants by the nature of their reproductive parts. These are of two kinds, the principal and most obvious of which, is a *theca*, or seed vessel containing the *sporules*, or seeds, and furnished with an *operculum*, or lid, by which they are retained, until ripe. The other kind consists of minute spherical bodies, concealed in the axils of the leaves, and called anthers, together with pistillate parts on distinct plants.

This is a subject of minute and laborious investigation, in which some persons have spent many years. It is impossible, therefore, in a book like this, intended chiefly for elementary instruction, to explain this part of botany in such a manner as to be of any considerable advantage to the pupil.

The Mosses which belong to this order are found chiefly in moist places, in the woods, and in the sheltered crevices of rocks. Wet, overflown bogs and side hills, with a northern exposure, also abound with the different species. The Lichens, on the contrary, are chiefly to be found in dry places, on the sunny sides of rocks or old stone walls, on the

What are the musci or mosses? What difference is pointed out with respect to the places where mosses and lichens grow?

barks of trees, and on the posts and rails of fences. The Mosses are found where there is but little circulation of air, while the Lichens grow in airy places.

The Mosses are found every where in the damp woods and among rocks, and many of them may be known by their thecæ or capsules, surmounted by their *operculi*, or lids. These parts are elevated above the green beds of moss by their pedicels or foot stalks, and many of them have a nodding position, as in Fig. 211.

Fig. 211.



Fig. 212.

The thecæ, or capsule, with its lid, or operculum, on the top; may be distinguished in the enlarged Fig. at the right hand.



Before the sori or seeds are ripe, both the capsule and lid are surrounded by the *calyptra*, Fig. 212, which, as these parts enlarge, splits open on one side, and is finally thrown off. Some plants of this tribe are very beautiful, but many of them are so small as to require a magnifying glass to distinguish their finest parts.

Of this order botanists have enumerated and figured many hundred species.

ORDER V.—HEPATICÆ. *Liverworts.*

This order is distinguished from the Algæ, or Flags, in not growing under water, and from the Mosses in not generally having a lid, or *operculum*. Some of the genera, however, as the very extensive one, called *Jungermannia*, are furnished with an operculum like the Mosses, but this bursts at the top, and forms four valves, instead of opening as it does in the Mosses.

Many of these plants are so minute as to require a mag-

How are the liverworts distinguished from the flags and mosses? In the algæ or flags, where are the seeds situated? Where are the plants found, which this order chiefly embraces?

nifier in order to detect their different parts. They are found on rocks, old walls, the bark of trees, and some of them in damp, shady bogs.

Fig. 213.



The small figure, 213, represents one of the *Jungermannia* species of the natural size. The larger, is the same magnified, showing the four-valved thecae at the top, after it has burst and discharged seeds. This species is called Dwarf Jungermannia and grows in small patches on rocks. Leaves elliptical-ovate; fruit terminal; mouth contracted and toothed; pedicel half an inch high.

This genus is named after Louis Jungermann, a German botanist.

ORDER VII.—ALGÆ. *Flags.*

In this order the seeds are embedded in the substance of the frond, or in the thecae, or tubercles variously situated. The plants are nearly all aquatic and submerged.

The order consists of the sea-weeds of the ocean, and the floating, scum-like substances of ditches and rivers. The fronds are sometimes thick and cylindrical, and sometimes they are like ribbons, extending many yards in length.

In other instances, this kind of vegetation is nothing more than a mere membrane, or a tuft of fine threads. The Sea Flags are in general fixed to rocks or stones by small expansions, or sometimes to the sand or mud by roots. It is supposed that their nourishment is imbibed from the water by their surfaces.

Fig. 214. Figure 214 represents one of the most common species of this genus, the Knotty Fucus, (*Fucus nodosus*.) It grows on stones and rocks near the shore of the sea. Frond compressed and leathery; here and there inflated with internal vesicles. These contain air, and therefore when heated or compressed, they burst with a small explosion. This and the other species of *Fucus* are burned for their ashes, which, when purified, form the soda of commerce. The impure product of the burning is called *kelp*.



The Flags form one of the lowest orders of vegetation,

To what important use are the sea-weeds converted.

being, in this respect, nearly on a parallel with the Lichens and Fungi. The investigation of these orders, and indeed of the whole flowerless class, requires great patience and industry, as well as much time and practice.

Many species of the present order, like those of the others, require the aid of a lens, more or less powerful, in order to discover the least sign of organization. But some of these when magnified are exceedingly curious and interesting, so much so, as often to strike the beholder with wonder, and to suggest the inquiry why they were made with so much apparent care and attention to symmetry, seldom to be observed by the eye of man, and only to be overwhelmed and buried in the depths of the sea. But the very fact observed, seems to suggest the answer, that the Creator has not seen fit to make his works less perfect, or less beautiful, because they are of such a nature, or so situated, that man cannot derive from them either profit or pleasure.

Many of the flocculent or scum-like substances which we see on the sea-shore, or in ditches, and which are commonly taken for the result of stagnation, are in reality minute vegetables, beautifully formed, and displaying as many wonders and more peculiarities than the most perfect plants of our gardens.

Fig. 215.



No one, not acquainted with this subject, would expect to find in the flocculent mass, Fig. 215, any thing like organization or symmetry. And yet on examination with a lens, it is found to be regularly and curiously organized, and to consist of grains joined together, each having its fruit contained in a proper capsule, as represented by the figure at the left hand.

The genus of this plant is *Ectocarpus*, which name is derived from the Greek, *ektos*, outside, and *karpos*, fruit, because the thecæ are not included in the substance of the frond, as in some of the genera, but are placed on the outside. The species figured is *granulosus*, or granular, because the whole appears to be composed of grains united into threads.

ORDER VIII.—LICHENS. *Rock and Tree Mosses.*

The Lichens, we have stated, are among the lowest or-

In what situations are the lichens chiefly found?

ders of vegetation. "They are leafless, flowerless, perennial plants, with a *thallus*, and external disk, containing sporules."—*Lindley*. The thallus is the frond, or crustaceous, leaf-like expansion, which forms the principal surface of this kind of vegetation. The *sporules*, or seeds, are usually contained in the *shields*, or cup-like receptacles which are dispersed over the thallus, or leaf-like expansion. Sometimes these little cups sit on the thallus without any pedicel, or foot-stalk, and sometimes they are elevated above it, by stalk-like processes, called *podetia*. In some species, the fruit is embedded in the frond. This order of plants is chiefly found on old fences, whether of wood or stone, on dry rocks, and on the bark of trees exposed to the air and light. No Lichen is found in the water; and in wet places, Dr. Lindley says their shields, or cups, are not produced.

One thousand species of this order have been minutely examined and described by authors, and probably as many more exist which remain unnoticed.

GENUS *Calicium*. Name from the Greek, *kalukion* a little cup, because the seed vessels are in the form of minute cups.

Fig. 216.



The upper figure represents one of the species of this genus of its natural size. the lower one is magnified, showing more distinctly the form of the cups.

This plant grows on decayed wood. Crust or thallus thin, whitish and powdery; disk flesh-colored, becoming brown; stalks naked, becoming brown or black.

There are several plants of this order which are employed for economical purposes, and one, (the celebrated Iceland Moss,) which is of great consequence in Arctic countries on account of its being the chief food of the rein-deer.

GENUS *Lecanora*. This genus contains two or three species which afford purple dyes, and are employed in coloring. Cudbear, (*Lecanora tartarea*,) one of these, has become an article of commerce to a considerable extent as a coloring drug. *Cudbear* is a corruption of Cuthbert, the person's name who first brought it into use. It comes chiefly from Norway; but it is said, that many an industri-

For what economical purposes are some of the lichens employed?

ous man obtains his living by scraping the rocks of the Scottish Highlands with an iron hoop, for this moss.

• Fig. 217.



Fig. 217 represents a species of this genus, called *Leptocarpus lecanora*. It grows in mountains; crust thin and leprous white; seed vessel elevated above the surface, but not on a stalk; disk plane, olive-colored.

ORDER IX.—FUNGI. *Mushrooms.*

This order consists mostly of thick fleshy bodies, without herbage, properly so called, and without a thallus. The sporules or seeds are arranged in little tubes placed on the inferior surface of the pileus or cap.

Fig. 218.



The *pileus*, or cap, is the expanded part of the Mushroom, placed on the upper end of the stipe. The *lamellæ*, or gills, consist of thin radiating expansions on the underside of the cap. Among these the sporules are placed. In the young state the cap is globular, and there is a thin membrane, or fringe, by which its margin is connected with the stipe, as in the left hand figure. This is called the *volva*, or curtain, and as the cap enlarges this bursts, or parts in the direction of the circumference of the pileus, so as to expose the gills. As the plant grows, this part becomes obsolete, and forms the ring around the stipe, called *annulus*, as shown in the right hand figure.

It is well known that this tribe of plants spring up almost every where, especially among decaying substances; and that thousands may be seen in the morning after a thunder storm, and a hot night, where none existed the evening before. Hence some have supposed that these vegetables were fortuitous developments, called into existence by the circumstances of heat, moisture, and peculiarity of soil, and therefore that no seeds were necessary for their production. That the growth or production of these vegetables depends on the circumstances of soil, heat, and moisture, is well known, since the gardeners who raise the esculent Mushroom, in beds constructed for that purpose, have a process so certain, that no other kind is ever known to spring up in these beds, though they may grow every where else in the

same vicinity. Hence the conclusion, that if the sporules of other kinds be present in these beds, they do not grow, because the soil is not suited to their growth. We are aware that a contrary argument has been drawn from the above named fact, and that because any quantity of the *Agaricus campestris*, or edible Mushroom, may be produced by certain conditions of soil, temperature, and moisture, without sowing the seeds, therefore Mushrooms cannot be the product of seeds floating through the air, for were this the case, other kinds besides the *campestris* would spring up, since the Mushroom beds would be as liable to receive the poisonous, as wholesome species. If we suppose that the sporules of the first crop perpetuate their own species, then there is no difficulty in accounting for a perpetual succession; and therefore, under this restriction, the only doubt refers to the first product. Now that the sporules of these plants exist every where, and that they only lie dormant until circumstances of soil, heat, and moisture, cause them to vegetate, may be safely inferred, or indeed is nearly certain, from the observations of M. Fries, of Sweden, whose knowledge on this subject no one will dare to deny. This naturalist says that the sporules of this tribe are so infinite in number, that in a single individual of the species, *Reticularia maxima*, he counted above ten millions. That these seeds are so small as scarcely to be visible to the naked eye, and that when rising in the atmosphere they often resemble thin smoke. That besides being disseminated by a kind of evaporation through the air, they are dispersed by the wind, by insects, elasticity, and adhesion, so that it is difficult to conceive a place from which they can be excluded. From all that has been said, we may fairly conclude, that the notion of fortuitous, or equivocal production, which has been employed to account for the appearance of Mushrooms, is entirely without foundation, and has been adopted from ignorance, or a limited view of the nature of this tribe. And also, that in whatsoever situation we may observe these productions, we may be sure that their sporules existed there before, but that the conditions of heat and moisture, and perhaps other circumstances unknown to us, had not been previously adapted to their vegetation. Or, as it appears that these sporules may be floating in the air, for ought we know, constantly, during certain seasons, they may have been deposited only just in time to vegetate. Many other seeds, it is well known, lie dormant for years,

or perhaps for ages, unless circumstances favorable to their vegetation occur. "Earth," says Dr. Smith, "taken from a considerable depth, and exposed to the air, will soon be covered with young plants, especially Thistles, and the Mustard kind." I believe, in such cases, no one has attempted to account for the fact in any other manner, than by supposing that the seeds of these plants lay dormant, until exposed to heat and light, or to conditions proper for their vegetation. Besides, if the Fungus tribes are fortuitous productions, their number of species must be infinite, for then any change in the conditions necessary to produce one species, would certainly produce a new one, and as soil, heat, and moisture, are subject to perpetual variations all over the world, so the number of species, or varieties, would be proportionate to the variation of such conditions.

In respect to the actual number of species belonging to this order, no estimate can be made. The number described by Sprengel, is about 2800, besides which other authors have described at least half as many more, so that the number of species arranged in botanical works amount to between 4000 and 5000. The Swedish cryptogamist, Fries, discovered no less than 2000 species of Fungi, within the compass of a square furlong, in Sweden. Nearly all that have been described, belong to the northern and temperate regions, the tropical species being almost unknown to authors. In North America, Prof Torrey has estimated that there are about 3000 known species of this order. Many species of this tribe are used as food in various parts of the world, but by far the greater majority of the whole tribe are poisonous.

In some parts of Kamtschatka the people are said to intoxicate themselves with a species of Fungi, for the same reason that the people of other nations drink wine and spirits. The species used for this purpose, is the *Amanita muscaria*. These are gathered during the warm season, and hung up by strings to dry, for future use. Sometimes this is used in soups and sauces, but the more common method is to swallow a small piece without chewing it, and to repeat this until the effect is such as to be satisfactory to the taker. One large, or two small Fungi, is the common dose, when the person desires to have his pleasant sensations or intoxication, to continue for the whole day. Cheerful emotions are first produced, after which a variety of ludicrous actions, and often much silly talk follows. On some it

produces very singular effects, so that if they wish to step over a straw, or small stick, they take a stride, or jump sufficiently high to clear the trunk of a tree. Others talk incessantly, and reveal all their own secrets, as well as those of their neighbors. Others become exceedingly active, and exert great muscular powers; while those who are fond of music, sing perpetually. When taken in still larger doses, it produces giddiness, spasms, or death-like drunkenness. Indeed, in its effects, it can hardly be distinguished from those produced by large quantities of wine, or ardent spirits. This statement is made by Dr. Langsdorff, to which we subjoin a figure of the species from Ency. of Plants.

Fig. 119.



Amanita muscaria. Fly-blown Agaric. Height 4 inches; margin of the cap striated; color, orange red; warty; stipe bulbous; poisonous.

A large proportion of the Mushrooms, are either offensive to the smell, or taste, or are poisonous. Some of them are so exceedingly virulent as to destroy life in a short time when eaten. Hence many of those who have made this department of botany a subject of investigation, and who therefore might be supposed best to know the appearance of the different species; will never taste the wild kinds for fear of the consequences. The kind which is cultivated for the table, when taken from the bed in which it is grown, it is said, has never been known to act as a poison. Large quantities of these are raised in the vicinities of large cities, for the markets, and in some countries, are in common use as an article of food. The species cultivated for this purpose is the *Agaricus campestris*, and among the many hundred known species, this is the only one now employed. It may be known by the following description from Loudon.

Gills loose, pinky red, changing to a liver color, in contact with the stem, but not united with it; very thick set, irregularly disposed, some forked next the stem, some next the edge of the pileus, or cap, some at both ends, and in that case generally excluding the intermediate smaller gills. The pileus, or cap, is white, changing to brown when old, and becoming scurfy. This part is regularly convex on the top, fleshy, grows flatter with age, and is from two to four, and sometimes nine inches in diameter. The flesh is white and liquifies by decay. The stem is solid, white,

cylindrical, from two to three inches high, and about half an inch in diameter; the ^{cap}curtain white and delicate. When this Mushroom first makes its appearance, it is smooth, and almost globular, and in this state is called a button. This species is esteemed the best and most savory of the genus, and is in much request for the table, in England. It is eaten fresh, either stewed or boiled, and preserved, either as a pickle, or in powder; and it furnishes the sauce called ketchup. The field plants are better for eating than those raised on artificial beds, their flesh being more tender, and those who are in the habit of doing so, distinguish the esculent from the poisonous kinds, by the smell. The wild Mushrooms are found in old fields and pastures, which have not been ploughed for many years, and the best time for gathering them is in the months of August and September.

NATURAL SYSTEM OF BOTANY. .

WE have already stated that there are two methods of arranging plants, called the *Artificial*, and the *Natural*. It is the chief design of this work to give the learner a competent knowledge of the former method, but as the latter is often referred to in books, and is withal of the highest importance to the scientific botanist, we here propose to give a short view of Professor Lindley's Natural Method.

"The notion," says this author, of classing species according to the likeness they bear to each other, which is the foundation of the Natural System, must have originated with the first attempts of man to reduce natural history to a science." The first writers who acknowledged any system, departed in no degree from what they considered a classification of plants, according to their general resemblances. Theophrastus has his *water plants*, and *parasites*, *pot-herbs*, *corn plants*, and *forest trees*. Dioscorides had his *aromatics*, his *gum bearing plants*, *edible vegetables*, and *corn herbs*, and the successors, imitators, and copyers of these writers retained the same arrangement for many ages."

The great distinction between the Artificial and Natural Systems, is readily understood, and may indeed be inferred from the above remarks. By the first, plants are arranged in conformity to the number, appearance, or situation of some particular organs, or parts, without reference to their properties, or qualities. By the other, they are distributed, according to their natural affinities, or qualities. Thus by the Linnæan system, where the arrangement depends on the number and positions of the stamens and pistils, there are often thrown into the same group, plants of the most discordant appearances, nature and habits. Thus in the class Pentandria and order Monogynia, we have arranged in the same group, all such plants as have five distinct stamens, and one style; and when we come to examine the characters of the plants so brought together, we find that, with the exception of the number and situation of the organs on which their classification depended, there is often the greatest possible discordance, and in many instances not a single point of affinity, either in quality, shape, or habit. Thus

in this class and order we have Comfrey and Henbane ; Thornapple, and the Grape vine; Honey-suckle, and Red-pepper; Ivy, which runs fifty feet high, with Claytonia, only two inches high. And in the class Enneandria and order Monogynia, we have, in like manner, the Cinnamon tree, associated with the Cashew-nut, &c.

In the Natural arrangement to be explained, on the contrary, the parts on which the Linnæan system is founded, viz. the stamens and pistils, corolla and calyx, are regarded no further than is consistent with other points of relationship. In the words of Professor Lindley, "the affinities of plants may be determined by a consideration of all the points of resemblance between their various parts, properties and qualities; and thence an arrangement may be deduced in which those species will be placed next each other which have the greatest degree of relationship; and consequently the quality or structure of an imperfectly known plant may be determined by those of another which is well known."

According to this system, therefore, it is not the property, habit, or number of stamens taken separately, that determines the place of a species, but all these characters taken in connection. Hence it will be obvious to the experienced botanist, that the vegetable kingdom, by this arrangement, must be divided into a very large number of families or orders.

But, as preparatory to these smaller divisions, this system separates all vegetables into two great classes, founded on their structure, or organization. These classes are called *Vasculares* and *Cellulares*. The first includes all the Linnæan plants which are classed by their stamens and pistils, and consequently all vegetables, except the class Cryptogamia. These are called *Phanogamous*, or *Flowering* plants. The second class, *Cellulares*, includes all plants not embraced by the first, and are called *Cryptogamous*, *Agamous*, or *Flowerless* plants. These two divisions are further characterized by the different modes in which the plants belonging to each are propagated. All flowering plants are propagated by seeds which are the result of the mutual action of the stamens and pistils, and which are composed of one or more parts called *Cotyledons*. Hence this division is sometimes called *COTYLEDONOUS*. The flowerless plants, on the contrary, have no seeds properly so called, but are multiplied by minute bodies, called *spo-*

rules, and in which nothing like cotyledons can be discovered. Hence the plants of this class are denominated *Acotyledonous*, that is, without cotyledons.

VASCULARES, PHENOGAMOUS, COTYLEDONOUS, and FLOWERING plants are therefore only different terms denoting the same combination of vegetables, and including all the Linnean species in which stamens and pistils are found. Also, the terms CELLULARES, CRYPTOGAMOUS, ACOTYLEDONOUS, and FLOWERLESS plants denote the same series of productions, and include such vegetables only as produce neither stamens, pistils, nor flowers.

In respect to the difference of structure on which these grand divisions are founded, the vasculares all possess spiral internal vessels, a more or less woody fibre, and have their leaves reticulated, the veins not parallel. The term is derived from the Latin *vas*, a vessel. It is however unnecessary for ordinary purposes, to ascertain the difference between the two classes by dissection, the veins of the leaves and the presence of the stamens and pistils being in all cases sufficient to determine the phanogamous nature of an individual.

The term Cellulares is derived from the Latin *cellula*, a little cell, and in its application denotes that the plants are cellular, but not vascular in their structure. Cellular plants are formed entirely of cellular tissue, but contain no spiral vessels, nor woody fibre, nor are their leaves traversed by veins as in the other class. The Ferns, however, approach nearly to the Vasculares, as their fronds possess parts analogous to veins; but as they are destitute, or nearly so, of spiral vessels, have no parts answering to cotyledons, and are withal entirely flowerless, they are strictly cellular plants.

These two great, but unequal divisions, being thus established on anatomical, as well as external characters, the class Vasculares is next separated into two sub-classes, founded on the different laws which govern their growth. It has been ascertained that some of the plants of this class increase by the addition of successive layers of new matter, or wood, on the outside, and that another, but smaller number, grow by additions on the inside. For this reason, the first of these divisions is called *Exogenous* and the other *Endogenous*; the first term signifying external, and the second internal increase.

Exogenous plants, of which the oak may be taken as an

example, increase, by forming a new layer of woody matter external to the old one, and between it and the bark, every year. Hence the ages of Exogenous trees are indicated by the concentric circles of which they are composed, and which appear to be occasioned by the cessation of growth during one period of the year, and the renewal of it in another. The centre of this vegetable system, is a spongy, or cellular substance, called the *pith*. Therefore, when the trunk of the Oak, Ash, or any other perennial Exogenous plant is sawn across, it exhibits bark on the outside, pith in the centre, and concentric deposits of woody matter between them, all connected by plates of cellular tissue, radiating from the centre to the circumference, and called *medullary rays*. These rays are very obvious on splitting a piece of oak.

Endogenous plants, of which the Lily, Palm, and Iris are examples, have no need of bark, or other external covering, to protect their newly formed parts from injury, since their additions are internal. In these plants, as the layers of new matter are not concentric but irregular, and neither correspond with particular seasons of growth, nor commence round a pith, or any other distinct centre of vegetation, there are no lines which distinguish the annual deposits from each other, or these from the bark and centre, as in the Exogenous species. In the Endogenæ, these parts are all confounded: in Exogenæ, they are all distinct.

The Exogenæ, and Endogenæ are further distinguished by a difference in their seeds, the first being all Dicotyledonous, that is, consisting of two cotyledons, or seed lobes, while the Endogenous tribe are all Monocotyledonous, or have only a single seed lobe. In the Exogenæ, also, the leaves are reticulated, or are formed like net work, while in the Endogenæ, the veins of the leaves run straight, and are parallel. The Exogenæ, or Dicotyledonous plants are subdivided into two tribes, called *Angiosperma*, and *Gymnosperma*; the first, denoting that the seeds are inclosed in a pericarp, and the second, that the seeds are naked, or destitute of a pericarp.

The Endogenæ, or Monocotyledonous plants, are also separated into two tribes, the first of which is called *Petaloidæ*, and include such plants as have a calyx and corolla, in three, or six divisions, or if these parts are absent, then the stamens and pistils are naked. The second tribe is

called *Glumaceæ*, and includes flowers which are destitute of a true calyx and corolla, but enveloped in imbricated bractæ.

The second class, *Cellulares*, as we have already seen, includes only such plants as are destitute of stamens, pistils, flowers, and spiral vessels. This is separated into three sections, called *Filicoideæ*, *Muscoideæ*, and *Aphyllæ*.

FILICOIDÆ includes such plants as have a distinct axis and vascular system, as the Ferns, Club-mosses and Horse-tails.

MUSCOIDÆ includes such as have a distinct axis, but not a vascular system, as Musci, (*Mosses*,) and Hepaticæ, (*Liverworts*.)

APHYLLE. These have neither a distinct axis, nor vascular system, as the Fungi, (*Mushrooms*,) Algæ, (*Flags*.)

Several other minor divisions are made in the class *Vasculares*, which however we shall at present omit to notice.

RECAPITULATION.

First Class, or Grand Division, VASCULARES, OR FLOWERING PLANTS.

Plants having distinct flowers, furnished with stamens and pistils.

This division includes all plants of the Linnæan system, except the class *Cryptogamia*, and is therefore by far the most important part of the vegetable kingdom.

They are called *Phanogamous* plants, because they bear visible stamens and pistils; and *Cotyledonous* plants, because their seeds consist of Cotyledons. Both of these terms distinguish them from the *Cryptogamia*, where no such parts exist.

The plants of this division are characterized by internal spiral vessels, and a woody fibre, but more obviously, by their flowers containing stamens and pistils, and the veiny appearance of their leaves.

SUB-CLASS 1. EXOGENOUS, OR DICOTYLEDONOUS PLANTS.

Leaves reticulated; stem with wood, pith, bark, and medullary rays; cotyledons two or more, placed opposite to each other.

This sub-class contains all such plants as have seeds composed of two, or more cotyledons. The number of species of the latter kind, are however very few, nearly all plants belonging here having seeds with only two cotyledons.

Tribe 1. **ANGIOSPERMÆ.***Seeds enclosed in a pericarp.*

This tribe includes all such plants as have two cotyledons, with their seeds enclosed in a pod, or shell, or in a coat which proceeds from the germen. Ex. Pea, Chestnut, Larkspur.

This tribe is divided into *Polypetalous*, *Apetalous*, *Achlamydeous*, and *Monopetalous* plants.

A. **POLYPETALOUS**, (*many-petalled*.) These have a calyx and corolla. Ex. Rose, Crowfoot.

B. **APETALOUS**, (*without petals*.) These have a calyx, but no corolla. Ex. Blitum.

C. **ACHLAMYDEOUS**. These have neither calyx nor corolla. Ex. Birch, Willow.

D. **MONOPETALOUS**. These have a single petal. Ex. Bignonia, (*Trumpet-flower*), Ipomea, (*Morning glory*).

Tribe 2. **GYMNOSPERMÆ.***Seeds destitute of a pericarpium.*

The plants of this tribe have neither stigma nor style, the influence of the pollen being communicated directly to the seed through a foramen, or orifice. They must not be confounded with the *Gymnospermæ*, or naked seeded plants of Linnaeus, which all belong to the tribe *Angiospermæ* of this system.

This tribe is divided into *Coniferae*, and *Cycadeae*.

CONIFERÆ. The Fir tribe. Ex. Pine, Juniper.

CYCADEÆ. Ex. Cycas, Zamia.

SUB-CLASS 2. ENDOGENÆ, or MONOCOTYLEDONOUS PLANTS.

Leaves with parallel veins. Stem with no distinction of wood, bark and pith. Flowers chiefly with a ternary division. Cotyledon one, and if two, placed alternate.

The plants of this sub-class hold an intermediate rank between the *Exogenes*, or *Dicotyledonous* plants, in which vegetation acquires its highest degree of development, and *Cellulares*, or *Cryptogamia*, where vegetation is of the lowest order. In *Exogenous* plants there are two cotyledons; in the *Endogenous* there is one cotyledon, and in *Cellulares* this part is entirely wanting. And the scale of vegetable development appears to be graduated in exact conformity to these circumstances, exhibiting a striking proof of the harmony that exists between the great features of vegeta-

tion, and their first principles, the seed from which they originate. The fact that the kind of seed is indicated by the appearance of the leaf, is a still more obvious and forcible illustration of the same harmony. On holding a leaf between the eye and the light, if it is found to be traversed with veins, largest at the base, and communicating with each other in all directions, like a net work, we may in general know that the seed of the plant to which it belongs has two cotyledons. Ex. Bean, Plum, Apple, Radish.

We may remark, also, as another distinctive character of the Exogenous species, that the leaves are articulated, or jointed with the stem, so that when they fall off, a scar remains on both parts.

If another leaf be held between the eye and the light, and its veins are found to run parallel with each other, from the base to the apex, without distinct, or net like communications, we may be sure that the seed from which it sprung had but a single cotyledon. Ex. Lily, Calla, Indian Corn, Wheat, and the grasses.

The philosophical student will be delighted with these examinations, as not only offering one of the most obvious and striking proofs of that harmony and design which exists in all the departments of nature, but also as a means of acquiring botanical knowledge.

The leaves of Endogenous plants, in general, have no articulation with their stems, like those which are reticulated. Ex. Iris, Lily.

The Endogenæ are divided into two tribes.

Tribe 1. PETALOIDEÆ.

The plants of this tribe are characterized by having a calyx, or corolla; and sometimes both, in three, or six divisions, or, if these parts are wanting, then the stamens and pistils are naked. This division comprehends all the plants with one cotyledon, except the Grasses and Sedges. Ex. *Alisma*, (*Water plantain*,) *Orchis*, *Iris*, *Lily*.

Tribe 2. GLUMACEÆ.

Flowers destitute of a true calyx, or corolla, but enveloped in scales, or chaffy bracts. This tribe comprehends the Grasses, properly so called, and the Sedge tribe, with which in many respects they are nearly allied.

The orders of this System are 272 in number, of which we select the following as examples.

AMYGDALÆ. *The Almond Tribe.*

(This includes the Peach also.)

Diagnosis. Polypetalous dicotyledons, with a superior solitary, simple ovary, having a terminal style; regular, perigynous, indefinite stamen; a drupaceous fruit; an exalbuminous, suspended seed, and alternate, stipulate, simple leaves, yielding hydrocyanic [prussic] acid.

Essential Characters. Calyx 5-toothed, deciduous, lined with a disk, the fifth lobe next the axis. *Petals* 5, perigynous. *Stamens* 20, or thereabouts, arising from the throat of the calyx, in aestivation curved inwards; anthers innate, 2-celled, bursting longitudinally. *Ovary* superior, solitary, simple, 1-celled; ovula 2, suspended; *styles* terminal, with a furrow on one side, terminating in a reniform stigma. *Fruit* a drupe, with the putamen sometimes separating spontaneously from the sarcocarp. *Seeds* mostly solitary, suspended in consequence of the cohesion of a funiculus umbilicalis, arising from the base of the cavity of the ovary, with its side embryo straight, with the radicle pointing to the hilum; *cotyledons* thick; *albumen* none; *trees*, or *shrubs*. *Leaves* simple, alternate, usually glandular towards the base; *stipules* simple, mostly glandular. *Flowers* white, or pink. Hydrocyanic acid present in the leaves and kernel.

Affinities. Distinguished from Rosacæ, (the Rose tribe,) and Pomacæ, (the Apple tribe,) by their fruit being a drupe, their bark yielding gum, and by the presence of hydrocyanic [prussic] acid. From Leguminosa, (the Pea tribe,) they are distinguished by the latter character, and also by their regular petals and stamens, and especially by the odd segment of the five lobed calyx of that order being inferior, not superior. This tribe is also distinguished from the Chrysobalanæ, (the Cocoa-plum tribe,) by the prussic acid, terminal styles, and regular petals and stamens of the former.

GEOGRAPHY. Natives exclusively of the northern hemisphere, where they are found in cold or temperate climates.

- *Properties.* The astringent, febrifugal properties of the Rose tribe, with which order these are usually combined, are also found in the Almond tribe, as in the bark of the *Cerasus Virginiana*, [*Prunus Virginiana* (Wild Cherry),] which is prescribed in the United States, and of the *Cerasus*

Capollim, of Mexico. They are, however, better known for yielding an abundance of prussic, or hydrocyanic acid, a deadly principle residing in the leaves and kernel; in consequence of which some of the species are poisonous to cattle, which feed upon them; as for example, the *Cerasus Capricida*, which kills the goats of Nipal, and the *Cerasus Virginiana*, which is known in North America to be dangerous. The whole tribe yields a gum analogous to gum tragacanth. Notwithstanding, however, the poisonous principle that is present in them, their fruit is, in many cases, a favorite food; that of the *Amygdalus*, (Peach, and Nectarine,) *Prunus*, (Plum, and Apricot,) and *Cerasus*, (Cherry,) are among the most delicious with which we are acquainted. The seed of the *Amygdalus* is familiar to us under the name of *Almonds*, and its oil under the name of *Oil of Almonds*. The bark of the root of *Cerasus Capollim*, is used in Mexico against dysentery. *Prunus domestica*, or the common Plum, yields those fruits sold in the shops under the name of *prunes*, which are chiefly prepared in France, from the varieties called the St. Catharine, and the green gage. They contain so much sugar that brandy is distilled from them when fermented, and it has been proposed to manufacture sugar from them.

Genera belonging to this natural order are the Almond, which includes the Peach and Nectarine, and of which there are six or eight species, and a great number of varieties; the *Prunus*, (Plum,) including the Apricot, of which there are ten or twelve species; and the *Cerasus*, (Cherry,) containing twenty or more species.

In our recapitulation of the definitions of the class, subclass, and tribe, for the purpose of ascertaining where the order *Amygdaleæ* belongs in the Natural System, we will take the common Peach as the representative of all the species the order contains.

1. The Peach tree is characterized by its pith, woody fibre, spiral vessels, and bark. It also has distinct flowers, furnished with stamens and pistils. This plant therefore belongs to Class I. VASCULARES, OR FLOWERING PLANTS.

2. The leaves of the Peach are distinctly reticulated with veins; they are articulated with the stem, and the seed contains two cotyledons, placed opposite to each other. It consequently belongs to Sub-Class I. EXOGENEÆ or DICOTYLEDONOUS PLANTS.

3. The seed is enclosed in a pericarp, called a *peach stone*, and therefore falls under Tribe I. **ANGIOSPERMÆ.**

4: The flowers of the Peach are many petalled, which brings it under Division A. **POLYPETALOUS.**

5. *The Essential Characters.* Calyx five-toothed, deciduous; petals five, perigynous; stamens 20, or more, arising from the throat of the calyx; ovary superior, &c. It is unnecessary to repeat the other characters of the order.

The many species and varieties of the order *Amygdalææ*, all coincide in possessing the various parts and properties indicated by the terms of the above scientific description, and therefore form as a whole, one Natural Order, or Tribe. The individual species differ in some degree, in the force, or quantity of their medicinal, or active properties, but they all agree in possessing more or less of that singular and deleterious substance, prussic acid. As another example, the Iris may be taken.

1. This plant has distinct flowers, furnished with stamens and pistils, and therefore belongs to Class I. **VASCULARES.**

2. It has a stem in which there is no distinction of wood, bark, and pith; and leaves in which the veins run parallel with each other, exhibiting no signs of proper reticulation. It therefore agrees with the description of *ENDOGENÆ*, or **MONOCOTYLEDONOUS PLANTS.**

3. The Iris has a corolla of six divisions, and therefore comes under Tribe I. **PETALOIDÆ.**

The description of the order is as follows:

IRIDÆÆ, THE CORNFLAG TRIBE.

Petals six; *stamens* three; *cotyledons* one; *ovarium* inferior; *anthers* turned outwards, and equidistant.

Essential Characters. Calyx and corolla superior, confluent; their divisions partly cohering, or entirely separate; sometimes irregular, the three petals occasionally being very short; *stamens* three, arising from the base to the sepals; *filaments* distinct, or connate; *anthers* bursting externally, lengthwise, fixed by their base, two celled; *ovarium* three celled, cells many seeded; *style* one; *stigmas* three, often petaloid, sometimes two lipped; *capsule* three celled, three valved, with a loculicidal dehiscence; *seeds* attached to the inner angle of the cell, sometimes to a central column, becoming loose. *Herbaceous* plants, or very seldom undershrubs, usually smooth. Inflorescence ter-

minal. Leaves equitant, and distichous, that is, overlapping each other in two rows.

Affinities. The plants of this order differ from the Narcissus tribe, in being Triandrous, with the anthers turned outwards; from orchideæ, to which they approach very nearly in some respects, in not being Gynandrous, and in all their anthers being distinct. The Iris represents the general character of the order, but a departure from the form of the perianthium, found in that genus, takes place in the Crocus. The dilated stigma found in the Iris is characteristic of the whole order; in the Crocus, it is rolled up, instead of being spread open.

Geography. Principally natives either of the Cape of Good Hope or of the middle parts of North America and Europe. A few only are found within the tropics, and the order is generally far from abundant in South America, if compared with the numbers that exist at the Cape.

Properties. More remarkable for their beautiful fugitive flowers than for their utility. The roots of some of them are slightly stimulating, as the violet-scented orris root, the produce of the Iris Florentina. The substance called *saffron* is the dried stigmas of a Crocus, one of the members of the order. In North America, according to the statement of Professor Torrey, we have twelve species of this order.

These examples are all which our limits will allow us to give. Meantime we commend to the pupil's attention, who desires to pursue this highly interesting subject, Professor Torrey's edition of Lindley's Natural System, recently published by the Messrs. Carvill, New-York.

CLASS I.—VASCULARES, OR FLOWERING PLANTS.

SUB-CLASS I.—EXOGENES, OR PLANTS WITH TWO COTYLEDONS.

Leaves reticulated, pith, wood, and bark distinct. Nearly all our trees, shrubs, and larger herbs are of this kind.

TRIBE I.—ANGIOSPERMÆ.

Seeds enclosed in a pericarp, or capsule.

1. POLYPETALOUS, APETALOUS, AND ACHLAMYDEOUS PLANTS.

Polypetalous plants, included here, have a calyx and a

corolla, with many petals. Apetalous plants have a calyx, but no corolla, (Ex. Poke,) and Achlamydeous plants have neither calyx nor corolla, (Ex. Birch, Willow.)

The following catalogue of Natural Orders is arranged according to Professor Lindley's Natural System of Botany. The orders include North American genera only, and embrace most of those arranged by Professor Torrey, of the New York University, in his edition of Lindley's Natural System, with the exception of the Grasses and Cellulares.

The examples do not include all Professor Torrey's genera. The properties are chiefly extracted from Professor Lindley.

1. ORDER I. ARALACEÆ. The Aralia tribe. Ex. Aralia, Panax. *Properties.* Ginseng, a species of Panax, is valued by the Chinese as a nervine.
2. UMBELLIFERÆ. The Umbelliferous Tribe. Ex. Cicuta, Sanicula, Daucus, Angelica, Conium, Sium. *Properties.* Herbs often poisonous, sometimes esculent, as Celery. Seeds warm and agreeable aromatics.
3. RANUNCULACEÆ. The Crowfoot tribe. Ex. Ranunculus, Hepatica, Coptis, Aquilegia, Actea, Thalictrum, Pæonia. *Prop.* Acrid or poisonous, sometimes simply astringent, or inert. The caustic principle is lost by drying.
4. PAPAVERACEÆ. The Poppy Tribe. Ex. Papaver, Sanguinaria, Chledonium. *Prop.* Narcotic, emetic, and stimulant. Opium is the dried juice of the Poppy.
5. NYMPHEACEÆ. The Water Lily Tribe. Ex. Nuphar, Nymphaea. *Prop.* Sedative, and emollient.
6. NELUMBOFÆ. Ex. Nelumbium. *Prop.* Inert herbs. Beautiful flowers.
7. HYDROPELTIDÆ. Ex. Hydropeltis. Cabomba. *Prop.* Unknown.
8. PODOPHYLLIÆ. The May Apple Tribe. Ex. Podophyllum, Jeffersonia. *Prop.* Cathartic.
9. CRUCIFERÆ. The Cruciferous Tribe. Ex. Thlaspi, Dentaria, Brassica, Cardamine, Sinapis, Lepidium, Arabis. *Prop.* Antiscorbutic, and stimulant, with an acrid flavor. In the Cress, Turnip, and Cabbage, this is pleasant.
10. FUMARIACEÆ. The Fumitory Tribe. Ex. Fumaria, Corydalis, Adlumia. *Prop.* Diaphoretic and aperient; aroma, none.

11. CAPARIDEÆ. The Caper Tribe. Ex. Cleome, Polanisia. *Prop. Stimulant and vesicatory.*
12. ANONACEÆ. The Custard Apple Tribe. Ex. Anona, Asimina. *Prop. Aromatic, succulent, and eatable.*
13. MAGNOLIACEÆ. The Magnolia Tribe. Ex. Magnolia, Liriodendron. *Prop. Bitter and tonic. Flowers fragrant. Ex. Magnolia.*
14. WINTEREÆ. The Winter's Bark Tribe. Ex. Illicium. *Prop. Stomachic and Carminative.*
15. Calycanthus. *Prop. Flowers aromatic and fragrant.*
16. LAURINEÆ. The Cinnamon Tribe. Ex. Laurus. *Prop. Highly aromatic, warm and spicy; odor pleasant. Contain Camphor.*
17. BERBERIDEÆ. The Berberry Tribe. Ex. Berberis, Leontice, Epimedium. *Prop. Acid and slightly astringent, the acid being oxalic.*
18. MENISPERMEÆ. The Cocculus Tribe. Ex. Menispermum, Cocculus. *Prop. Bitter and tonic, the seeds of some narcotic.*
19. MALVACEÆ. The Mallow tribe. Ex. Malva, Hibiscus, Sida. *Prop. Wholesome, mucilaginous, and emollient.*
20. TILIACEÆ. The Linden Tribe. Ex. Tilia. *Prop. None; handsome trees.*
21. GUTTIFERÆ. The Mangosteen Tribe. Ex. Clusia. *Prop. The species abound in a yellow, purgative, gum resinous juice.*
22. HYPERICINEÆ. The Tutsan Tribe. Ex. Hypericum, Ascyrum. *Prop. Cathartic and febrifugal.*
23. SAXIFRAGEÆ. The Saxifrage Tribe. Ex. Saxifrage, Heuchera, Adoxa, Parnasia. *Prop. Astringent. Little used.*
24. HAMAMELIDEÆ. The Witch-Hazle tribe. Ex. Hamamelis, Fothergilla. *Prop. Unknown.*
25. PHILADELPHÆÆ. The Syringa Tribe. Ex. Philadelphia. Decumaria. *Prop. Unknown.*
26. GROSSULARIA. The Currant Tribe. Ex. Ribies. *Prop. Acidulous and Tonic.*
27. CACTEÆ. The Indian Fig Tribe. Ex. Opuntia, Mammillaria. *Prop. Acidulous and agreeable.*
28. ONAGRARIÆ. The Evening Primrose Tribe. Ex. Epilobium, Oenothera, Isnardia. *Prop. Few or unknown.*
29. CIRCÆACEÆ. The Enchanter's Nightshade Tribe. Ex. Cereæa. *Prop. Unknown.*

30. SALICARIÆ. The Loosestrife Tribe. Ex. Peplis, Lythrum. *Prop. Astringent and acrid.*
31. RHIZOPHORÆ. The Mangrove Tribe. Ex. Rhizophora. *Prop. Astringent.*
32. MELASTOMACEÆ. Ex. Rhexia. *Prop. Slightly astringent.*
33. ELÆAGNEÆ. The Oleaster Tribe. Ex. Elæagnus, Shephardis. *Prop. The fruit of some eatable.*
34. ARISTOLOCHIÆ. The Birthwort Tribe. Ex. Aristolochia, Asarum. *Prop. Highly tonic and stimulating; much used in medicine.*
35. SANTALACEÆ. The Sanders Tribe. Ex. Nyosa, Hamiltonia. *Prop. Sedative, and one species odoriferous.*
36. THYMELEÆ. The Mezerum Tribe. Ex. Dirca. *Prop. Bark caustic, blistering the skin.*
37. SANGUISORBEÆ. The Burnet Tribe. Ex. Sanguisorba, Alchemilla. *Prop. Slightly astringent.*
38. ROSACEÆ. The Rose Tribe. Ex. Rosa, Spiræa, Geum, Gillenia, Agrimonia. *Prop. All wholesome, and mostly astringent. Some highly odoriferous. Geum and Spiræa are good astringents.*
39. POMACEÆ. The Apple Tribe. Ex. Pyrus, Cratægus. *Prop. Delicious food, except a species or two.*
40. AMYGDALÆ. The Almond Tribe. Ex. Prunus, Amygdalus. *Prop. Delicious acidulous fruits; seeds and leaves yielding prussic acid.*
41. LEGUMINOSÆ. The Pea Tribe. Ex. Pisum, Phaseolus, Lupinus, Mimosa, Robinia, Lathyrus, Apios, Hedy-sarum, Acacia, Cassia, Gleditschia. This order is so numerous, and contains such a diversity of species as to be divided into several sections. *Prop. General character eminently wholesome, as the Pea, Bean, and Vetch. Some species of Mimosa and Lathyrus are deleterious. The order contains some of the most splendid flowering trees. The Logwood, and Rosewood of commerce also belong here.*
42. URTICEÆ. The Nettle Tribe. Ex. Urtica, Cannabis, Humulus. *Prop. Narcotic and bitter, sometimes poisonous. The Hop is universally employed in making beer.*
43. ULMACEÆ. The Elm Tribe. Ex. Ulmus, Planera, Celtis. *Prop. Unimportant; noble trees.*
44. ARTOCARPEÆ. The Bread Fruit Tribe. Ex. Morus, Maclura. *Prop. Quite opposite. The Fig, Mulberry, and Bohon Upas belong here.*

45. CUPULIFERÆ. The Oak Tribe. Ex. *Quercus*, *Castanea*, *Corylus*, *Fagus*. *Prop.* *Astringents. Contain much tannin and gallic acid. Noble trees of the forest.*
46. BETULINÆ. The Birch Tribe. Ex. *Betula*, *Alnus*, *Carpinus*. *Prop.* *Bark astringent and aromatic, or containing coloring matter.*
47. SALICINÆ. The Willow Tribe. Ex. *Salix*, *Populus*. *Prop.* *Bark astringent and tonic. Ornamental trees.*
48. PLATANÆ. The Plane Tribe. Ex. *Platanus*, *Liquid amber*. *Prop.* *Noble trees.*
49. JUGLANDÆ. The Walnut Tribe. Ex. *Juglans*, *Carya*. *Prop.* *Bark astringent; fruit oily and eatable; fine timber trees.*
50. MYRICÆ. The Gale Tribe. Ex. *Myrica*, *Comptonia*. *Prop.* *Aromatic shrubs. One species yields wax.*
51. EUPHORBIACÆ. The Euphorbium Tribe. Ex. *Euphorbia*, *Acalypha*, *Croton*, *Jatropha*, *Tragia*. *Prop.* *Generally stimulant and exciting. Some emetic, others acrid and poisonous. Some contain a milky juice which is used as a varnish.*
52. EMPETRÆ. The Crowberry Tribe. Ex. *Empetrum*, *Ceratiola*. *Prop.* *Unknown.*
53. RHAMNÆ. The Buckthorn Tribe. Ex. *Rhamnus*, *Ceanothus*. *Prop.* *Berries cathartic; leaves mild astringent.*
54. STAPHYLEACÆ. The Bladder-nut Tribe. Ex. *Staphylia*. *Prop.* *Unknown. Handsome shrubs.*
55. HIPPOCASTANÆ. The Horse Chestnut Tribe. Ex. *Pavia*. *Prop.* *Seeds farinaceous; bark bitter.*
56. SAPINDACÆ. The Soap-tree Tribe. Ex. *Sapindus*, *Cardiospermum*. *Prop.* *Fruit eatable; leaves often poisonous.*
57. ACERINÆ. The Sycamore Tribe. Ex. *Acer*, *Negundium*. *Prop.* *Sap of the Acer yields sugar.*
58. VITES. The Vine Tribe. Ex. *Vitis*, *Ampelopsis*. *Prop.* *The Vine is well known as yielding wine and raisins.*
59. MELIACÆ. The Bread-tree Tribe. Ex. *Melia*. *Prop.* *Fruit oily, sometimes aromatic; bark tonic.*
60. ANACARDIACÆ. The Cashew Tribe. Ex. *Rhus*. *Prop.* *Trees or shrubs with acrid, or poisonous juice, sometimes employed as varnish. Some are used in tanning.*
61. GERANIACÆ. The Geranium Tribe. Ex. *Geranium*

- Prop.* Some species highly odoriferous; root of others astringent; favorite house plants.
62. **OXALIDEÆ.** The Wood Sorrel Tribe. Ex. Oxalis. *Prop.* Foliage containing oxalic acid. Some are astringent.
63. **BALSAMINEÆ.** The Balsam Tribe. Ex. Impatiens. *Prop.* Capsules remarkable for expelling their seeds.
64. **POLYGALÆÆ.** The Milkwort Tribe. Ex. Polygala, Krameria. *Prop.* Root milky; leaves bitter; emetic, sudorific, and expectorant.
65. **VIOLACEÆ.** The Violet Tribe. Ex. Viola, Solea. *Prop.* Roots emetic, mucilaginous; favorite flowers.
66. **PASSIFLOREÆ.** The Passion Flower Tribe. Ex. Passiflora. *Prop.* Unknown. Climbing plants with beautiful flowers.
67. **CISTINEÆ.** The Rock-Rose Tribe. Ex. Lechea, Hudsonia. *Prop.* One species yields a balsamic resin.
68. **SARRACENIÆÆ.** The Side-saddle Flower Tribe. Ex. Sarracenia. *Prop.* Unknown. Curious plants, the leaves containing water.
69. **DROSERACEÆ.** The Sundew Tribe. Ex. Drosera, Dionæa. *Prop.* Unknown. The *Dionæa* has a leaf which catches flies by closing upon them.
70. **LINEÆ.** The Flax Tribe. Ex. Linum. *Prop.* Seeds mucilaginous and diuretic; fibre tenacious, forming linen thread.
71. **CARYOPHILLEÆ.** The Chickweed Tribe. Ex. Dianthus, Saponaria, Mollugo, Spergula, Lychnis. *Prop.* Qualities insipid. The Pink genus fragrant and beautiful; the species of little note.
72. **ELATINEÆ.** The Water Pepper Tribe. Ex. Crypta. *Prop.* Unknown.
73. **CRASSALACEÆ.** The House-leek Tribe. Ex. Tillæa, Sedum, Penthorum. *Prop.* Refrigerant, and somewhat acrid.
74. **TICOIDEÆ.** Ex. Sesuvium. *Prop.* The succulent leaves sometimes eaten.
75. **AMARANTACEÆ.** The Amaranth Tribe. Ex. Amaranthus, Iresene, Oprotheca. *Prop.* Leaves of some used for pot herbs. One species used for fevers and colics.
76. **CHENOPODEÆ.** The Goosefoot Tribe. Ex. Chenopodium, Atriplex, Salicornia, Blitum. *Prop.* Pot Herbs and Pickles. Also a vermifuge oil and soda.

77. **PHYTOLACCEÆ.** The Virginian Poke Tribe. Ex. *Phytolacca*, Rivina. *Prop.* *Emetic and anti-rheumatic.*
78. **POLYONEÆ.** The Buckwheat Tribe. Ex. *Rumex*, *Polygonum*, *Eriogonum*. *Prop.* *Herbs acid and agreeable; roots nauseous and purgative. The seed of one species forms edible flour.*
79. **NYCTAGINEÆ.** The Marvel of Peru Tribe. Ex. *Abronia*, *Boerhaavia*, *Mirabilis*. *Prop.* *Inspid; generally weeds. Mirabilis is cultivated as an ornament.*
80. **PIPERACEÆ.** The Pepper Tribe. Ex. *Piper*. *Prop.* *Pungent, stimulant, aromatic and wholesome.*
81. **CALLITRICHINEÆ.** The Starwort Tribe. Ex. *Callitriche*. *Prop.* *Unknown. Aquatic plants.*

2. MONOPETALOUS PLANTS.

The corollas of the plants under this division, form single floral envelopes, or are of one piece, and not separable into distinct petals, like those of the last division.

82. **ILICINEÆ.** The Holly Tribe. Ex. *Ilex*, *Prinos*. *Prop.* *Bark and berries astringent and tonic.*
83. **ERICÆÆ.** The Heath Tribe. Ex. 1st. *Arbutus*, *Gaultheria*, *Andromeda*, *Clethra*. 2d. *Kalmia*, *Rhododendron*, *Azalea*, *Ledum*. *Prop.* *The first division diuretic; 2d, astringent. Some are poisonous, as Kalmia; some aromatic, as Gaultheria.*
84. **VACCINEÆ.** The Bilberry Tribe. Ex. *Vaccinum*, *Oxycoccus*. *Prop.* *Bark and leaves tonic; fruit agreeable and wholesome.*
85. **PYROLACEÆ.** The Wintergreen Tribe. Ex. *Pyrola*, *Chimaphila*, *Monotropa*. *Prop.* *Tonic and diuretic. Used to flavor beer.*
86. **CAMPANULACEÆ.** The Campanula Tribe. Ex. *Campanula*, *Prisnatocarpus*. *Prop.* *Inactive, but beautiful flowers.*
87. **LOBELIACEÆ.** The Lobelia Tribe. Ex. *Lobelia*, *Clintonia*. *Prop.* *Suspicious, or actually poisonous. Lobelia inflata is emetic, sudorific and expectorant.*
88. **CUCURBITACEÆ.** The Gourd Tribe. Ex. *Cucumis*, *Momordica*, *Melothria*. *Prop.* *Useful as food and medicine. Colocynth comes from a Cucumis, and so does the Cucumber and Melon.*
89. **PLANTAGINEÆ.** The Rib-Grass Tribe. Ex. *Plantago*. *Prop.* *Slightly bitter and cooling. P. Lanceolata, vulgaris.*

90. **PLUMBAGINÆ.** The Leadwort Tribe. Ex. *Statice*, *Armeria*, *Plumbago*. • *Prop.* *Opposite. Some tonic and astringent; others acrid and caustic.*
91. **VALERIANÆ.** The Valerian Tribe. Ex. *Valerian*, *Phyllactis*. *Prop.* *Antihysterical, and aromatic. The roots of the Valerian highly odoriferous and antispasmodic.*
92. **COMPOSITÆ.** This is an extensive Natural Order, and is divided into the following Sub-Orders and Tribes.
- SUB-ORDER 1.—Cichoraceæ.** Tribe 1.—*Hieraceæ.* Ex. *Hieracium*, *Prenanthes*, *Crepis*.
- TRIBE 2.—Taraxaceæ.** Ex. *Leontodon*, *Apargia*, *Cynthia*.
- TRIBE 3.—Lactuceæ.** Ex. *Lactuca*, *Sonchus*.
- TRIBE 4.—Chicoreæ.** Ex. *Cichorium*.
- SUB-ORDER 2.—Carduaceæ.** Ex. *Arctium*, *Carduus*, *Elephantopus*, *Vernonia*, *Gnaphalium*, *Liatris*.
- SUB-ORDER 3.—Asterceæ.** Ex. *Erigeron*, *Aster*, *Solidago*, *Bellis*.
- SUB-ORDER 4.—Eupatorineæ.** Ex. *Eupatorium*, *Kuhnia*.
- SUB-ORDER 5.—Jacobceæ.** Ex. *Cacalia*, *Tussilago*, *Senecio*.
- SUB-ORDER 6.—Heliantheæ.** Ex. *Helianthus*, *Rudbeckia*, *Coreopsis*, *Bidens*, *Chrysanthemum*, *Galardia*.
- SUB-ORDER 7.—Ambrosiaceæ.** Ex. *Parthenum*, *Ambrosia*, *Iva*, *Xanthium*.
- Properties.* *There is a bitterness peculiar to most of the Compositæ; sometimes mixed with tonic, stomachic, or febrifugal virtues, and sometimes with mucilage, or highly odorific principles; others of this order, as Lettuce, contain opium, and others are insipid and inert.*
93. **SELLATÆ.** The Madder Tribe. Ex. *Galium*, *Rubia*. *Prop.* *Important as affording coloring matter for dyes. The Indians of the Wes color a beautiful red with Galium.*
94. **CINCHONÆ.** The Peruvian Bark Tribe. Ex. *Dioda*, *Cephalanthus*, *Mitchella*. *Prop.* *The barks of the true Cinchonæ are powerful tonics and febrifuges; qualities depending on the alkalies Cinchonina, and Quinia, but the properties of their affinities are little known.*
95. **CAPRIFOLIACEÆ.** The Honeysuckle Tribe. Ex. 1st, *Caprifolium*, *Lonicera*, *Linnæa*, *Diervilla*, *Triosteum*; 2d, *Viburnum*, *Sambucus*; 3d, *Cornus*; 4th, *Hydrangea*. *Prop.* *The Honeysuckles have no properties beyond their beauty and fragrance. Elder is slightly cathartic, the*

flowers being good for infants. Dogwood bark is highly tonic, Triosteum is cathartic and febrifuge.

96. ASCLEPIADEÆ. The Milkweed Tribe. Ex. Asclepias, Gonolobus, Periploca, Cynanchum. *Prop. Roots stimulating, sometimes emetic, or cathartic. Asclepias decumbens is sudorific.*
97. APOCYNÆ. The Dog's Bane Tribe. Ex. Apocynum, Amsonia, Echites. *Prop. Similar to those of Asclepiadea, but perhaps more active and suspicious.*
98. GENTIANÆ. The Gentian Tribe. Ex. Gentiana, Fraxera, Exacum, Centaurella, Houstonia, Villarsia, Menyanthes. *Prop. Intense bitterness of the root and stem, being tonic, stomachic, and febrifugal.*
99. SPIGELIACEÆ. The Wormseed Tribe. Ex. Spigelia. *Prop. Powerfully vermifugal.*
100. CONVULVULACEÆ. The Bindweed Tribe. Ex. Convolvulus, Ipomœa, Cuscuta, Evolvulus. *Prop. The roots abound in milky juice, which is cathartic. Scamony and jalap are produced from plants of this order.*
101. POLEMONIACEÆ. The Greek Valerian Tribe. Ex. Polemonium, Phlox, Collomia, Ipomosis. *Prop. Unknown. Probably none.*
102. HYDROLEACEÆ. Ex. Hydrolca, Diapensia. *Prop. Hydrolea is slightly bitter.*
103. EBENACEÆ. The Ebony Tribe. Ex. Diospyrus. *Prop. Remarkable only for the hardness and blackness of the wood, and edible quality of the fruit.*
104. OLEACEÆ. The Olive Tribe. Ex. Olea, Ligustrum, Chionanthus, Fraxinus. *Prop. This order affords the only instance in which oil is contained in the pericarp, this being the case with the common Olive. Manna comes from the Ash.*
105. PRIMULACEÆ. The Primrose Tribe. Ex. Primula, Lysamachia Trientalis, Glaux, Anagallis, Samolus. *Prop. Modest, favorite flowers.*
106. LENTIBULARIÆ. Ex. Pinguicula, Utricularia. *Prop. None, or unknown.*
107. OROBANCHEÆ. The Broom-rape tribe. Ex. Orobanche, Epiphagys. *Prop. The Orobanche virginica is said to form a part of Martin's famous cancer powder.*
108. SCROPHULARINEÆ. The Figwort Tribe. Ex. *Prop.* 1st. Veronica, Leptandra; 2d, Buchnera; 3d, Scrophularia, Antirrhinum, Mimulus, Gratiola, Chelone, Gerar

- dia, Capraria. *Prop.* Generally somewhat acrid and bitterish. The root of *Scrophularia* is a popular remedy in scrofula.
109. RHINANTHACEÆ. The Rattle Tribe. Ex. Rhinanthus, Pedicularis, Euphrasia, Bartsia, Eucroma, Melampyrum. *Prop.* Not worthy of notice.
110. SOLANÆ. The Nightshade Tribe. Ex. Solanum, Physalis, Nicotiana, Datura, Capsicum, Verbascum. *Prop.* These are very discordant, including on one hand the deadly Nightshade, the Henbane, and Stramonium, and on the other the wholesome Potato, Tomato, and Egg-plant. Perhaps the narcotic properties of these esculents are destroyed by cooking, a circumstance not uncommon in vegetables.
111. ACANTHACEÆ. The Justicia tribe. Ex. Justicia, Ruellia, Elytraria. *Prop.* Little known.
112. PEDALINEÆ. The Oil-seed tribe. Ex. Martynia. *Prop.* Leaves of some, emollient.
113. VERBENACEÆ. The Vervian Tribe. Ex. Verbena, Callicarpa, Lantana. *Prop.* Of little importance.
114. LABIATÆ. The Mint Tribe. This order is divided into several sections. Ex. 1st. Mentha, Lycopus; 2d, Pycnanthemum, Thymus, Origanum; 3d, Teucrium, Collinsonia, Trichostema; 4th, Monarda, Cunila, Synandra; 5th, Nepeta, Leonorus, Lamium, Glechoma, Marrubium, Melissa, Prunella, Scutellaria, Salvia; 6th, Hyptis. *Prop.* Their tonic, cordial, and stomachic qualities, due to the presence of an aromatic volatile oil, and a bitter principle, are the universal feature of *Labiata*, which do not contain a single unwholesome, or even suspicious species.—Lindley.
115. BORAGINEÆ. The Borage Tribe. Ex. Lycopsis, Lithospermum, Symphytum, Myosotis. *Prop.* Soft, emollient and mucilaginous.
116. HYDROPHYLLÆ. The Water Leaf Tribe. Ex. Hydrophyllum, Nemophila, Phacelia. *Prop.* Unknown.

TRIBE. 11.—GYMNOSPERMÆ.

Seeds destitute of a pericarp.

117. CYCADEÆ. Ex. Zamia. *Prop.* They abound in a mucilaginous, nauseous juice.
118. CONIFERÆ. The Fir Tribe. Ex. Pinus, Taxus, Abies, Larix, Thuya, Juniperis, Cupressus. *Prop.* This

NATURAL

order contains an assemblage of the most noble and important of all the forest trees.* From the species, not only the masts and spars of ships are obtained, but also in a commercial relation, the equally necessary articles, tar, pitch, resin and turpentine.

SUB-CLASS II.—ENDOCENÆ, OR PLANTS WITH ONE COTYLEDON.

Leaves often sheathing at the base, and not articulated with the stem, veins chiefly parallel. Flowers with the calyx in three divisions, and a corolla in three or six divisions. Stem without any distinction of wood, bark, and pith.

TRIBE I.—PETLOIDÆ.

Plants of this tribe have flowers with petals of good size, as Iris, and Water Plantain. Or in some instances they are spadaceous, as in Arum.

119. ALLISMACEÆ. The Water Plantain Tribe. Ex. *Alisma*, *Sagittaria*. *Prop.* The root is fleshy and eatable. *Alisma plantago* was formerly said to cure hydrophobia.
120. HYDROCHARIDÆ. The Frog-bit Tribe. Ex. *Hydrocharis*, *Vallisneria*. *Prop.* Insipid water-plants.
121. COMMELINÆ. The Spider-wort Tribe. Ex. *Commelina*, *Tradescantia*. *Prop.* Mere weeds, or sometimes fine flowering plants.
122. BROMELIADÆ. The Pine Apple Tribe. Ex. *Tillandsia*, *Agave*. *Prop.* The flavor of the Pine Apple is well known. The *Agave* is a thick leaved plant, which, when tapped, is said to yield a juice capable of making wine.
123. AMARYLLIDÆ. The Narcissus Tribe. Ex. *Amaryllis*, *Crinum*, *Pancratium*. *Prop.* Beautiful, flowering bulbs, some of which are acrid, and one poisonous.
124. IRIDÆ. The Cornflag Tribe. Ex. *Iris*, *Sisyrinchium*, *Trichonema*. *Prop.* Flowers very beautiful, but fugitive. The roots of some species are deleterious, others are cathartic.
125. ORCHIDÆ. The Orchis Tribe. This order contains many species, and is subdivided into several sections. Ex. 1. *Neottea*, *Goodyera*, *Neottia*, *Listeria*; 2. *Are-*

thusea, Pogonia, Colopogon, Epipactis, Arethusa, Aplectrum, Triphora; 3. *Qphrydeæ*, Orchis, Habenaria, Tipularia; 4. *Epidendrea*, Epidendrum, Bletia; 5. *Malaxidæ*, Liparis, Mycrostylis, Calypso; 6. *Cypripediæ*, Cypripedium. *Prop.* Singular; highly beautiful, and often highly fragrant flowers; but generally of little known utility. One Species of Orchis, however, affords the SALEP of the shops.

126. **MARANTACEÆ.** The Arrow-root Tribe. Ex. Thalia, Maranta, Canna. *Prop.* Highly valuable roots, on account of yielding the fecula called arrow-root, an article universally known as food for the sick.

127. **JUNCEÆ.** The Rush Tribe. Ex. Juncus, Pleea, Luzula, Narthecium. *Prop.* Used chiefly for the bottoms of chairs, and other mechanical purposes.

128. **MELANTHACEÆ.** The Colchicum Tribe. Ex. Veratrum, Melanthium, Nolina, Tofeldia. *Prop.* This is a deleterious order, all the species being more or less poisonous. The root of the Colchicum is a drastic emetic, and cathartic; and that of the Veratrum, even in small doses, is highly exciting and irritative.

129. **PONTEDERÆ.** The Pickerel-weed Tribe. Ex. Pontederia, Heteranthera. *Prop.* Showy flowers of no use.

130. **ASPHODELEÆ.** The Asphodel Tribe. Ex. Scilla, Allium, Asparagus, Aletris, Anthericum. *Prop.* These are various. The Onion tribe are strong-scented esculents; Scilla, or Squill is expectorant; Aletris is bitter and tonic. The Aloe, which also belong here, is strongly cathartic. They all, however, agree in containing a stimulant, or acrid principle, more or less concentrated.

131. **SMILACEÆ.** The Smilax Tribe. Ex. Smilax, Convallaria, Medeola, Trillium, Uvularia, Streptopus. *Prop.* The fleshy root of Medeola is eaten as a salad. Smilax is emollient. The root of Trillium is emetic.

132. **LILIUM.** The Lily Tribe. Ex. Lilium, Fritillaria, Yucca, Erythronium. *Prop.* Remarkable for their beautiful flowers. In Kamtschatka, one kind of Lily root is eaten.

133. **AROIDEÆ.** The Arum Tribe. Ex. Arum, Acorus, Orontium, Caladium, Symplocarpus, Calla. *Prop.* Little known. The root of Acorus calamus is carminative, and aromatic. The pollen of Typha is inflammable.

134. FLUVIALES. Ex. *Zostera*, *Caulinia*, *Ruppia*, *Potamogeton*. *Prop. Unimportant.*
135. PISTIACEÆ. The Duckweed Tribe. Ex. *Lemna*, *Pistia*. *Prop. Of no importance.*

The above epitome will not only inform the pupil what are the properties of the several genera contained under each order, after he has ascertained their names by the Linnæan system, but will also often assist him in finding the names of unknown plants. Suppose he meets with the *Orontium*, for example, a plant whose name he does not know. Now in this plant the stamens are often indistinct, and difficult to be ascertained. It is arranged in class Hexandria, but its appearance instantly associates it with *Calla*, *Arum*, and *Acorus*. Its leaf, with parallel veins, and sheathing footstalks, and its stem, without distinction of wood, pith and bark, shows that it is an Endogenous plant, like Sweet Flag and its associates; and its spadix betrays a still nearer affinity to this tribe. If, then, the pupil, being already acquainted with Sweet Flag, *Arum*, &c. refer his plant to this order, and there finds, *Orontium*, the name of a genera he does not know, he has only to find the description of this plant among the artificial genera, in order to ascertain the name of his species. This is intended merely as an illustration of many instances in which the pupil may obtain the knowledge he desires by the same means.

GLOSSARY

TERMS USED IN BOTANY.

- A**, in composition, signifies wanting, or without, as *acaulis*, without a stem.
- Abortive.** Producing no fruit. Ex. Snowball.
- Abrupt.** Terminating suddenly, as if cut off, as in the root of Bloodroot.
- Wanting the odd terminal leaf. Ex. Cassia Marylandica, (*Senna*.)
- Acerose.** Stiff and slender, with a sharp point. Ex. Leaves of the Pine.
- Achlamydeous.** Flowers without calyx or corolla. Ex. Willow, Birch.
- Acicular.** Needle shaped.
- Acinaciform.** Scimitar shaped. Linear sharp edged and crooked.
- Acinus.** One of the protuberances in a compound berry. Ex. Rubus villosus, (*Black-berry*.)
- Acotyledonous.** Having no cotyledons or seed lobes. Ex. Mushrooms.
- Aculeate.** Prickly. Ex. Rose bush.
- Aculeus.** A prickle growing to the bark, but not to the wood. Ex. Rose bush, Fig. 90.
- Acuminate.** Ending in an extended sharp point. Ex. *Urtica dioica*, (*Common Nettle*.) Fig. 49.
- Acutc.** Ending in a sharp point, but less extended than acuminate. Ex. Leaves of *Asclepias*, (*Milk-weed*.)
- Adelphous.** Brotherhood. Applied to plants whose stamens are united by their filaments. Ex. Pea, Mallows.
- Adnate.** Adhering to a thing. Anthers are called adnate, when they adhere to the filaments by their whole length.
- Adult.** Full grown. An adult plant is one that has obtained its full size.
- Æstivation.** Præfioration. The manner in which the floral envelopes are arranged before they expand.
- Agglomerated.** Collected into a head. Crowded together. Ex. Cauliflower.
- Aggregated.** Collected together, as when many flowers grow on the same receptacle, not compound. Ex. *Armeria*, (*Thrift*.)
- Alated.** Winged. Ex. Seeds of the Maple.
- Albumen.** The tough substance surrounding the embryo of certain seeds.
- Ex. *Reseda*, (*Mignonette*.)
- Albuminous.** Partaking of the nature of albumen.
- Alge.** An order of Cryptogamous plants, including the Sea-weeds.
- Alternate.** Placed one after the other. The leaves of the *Asters* are alternate.

- Alveolate.** Like a honey-comb. Applied to the involucre of certain plants. Ex. Borkhausia.
- Ament.** A Catkin. A certain mode of inflorescence. Ex. Chestnut, Birch.
- Amplexicaul.** Clasping the stem. The leaf joins the stalk without a petiole. Ex. Aster amplexicaulis.
- Ancipital.** Two-edged.
- Androgynous.** Producing both barren and fertile flowers on the same plant. Ex. Indian Corn.
- Angulo-dentate.** Angularly toothed. Ex. Lapsania, (*Nipplewort*.)
- Annual.** Living but one year, in which time it produces flower and seed. Ex. Cucumber.
- Anther.** That part of the stamen which contains the pollen, very apparent in the Lilies, Fig. 96.
- Annulations.** Rings, or circles.
- Anterior.** Growing before, or in front, as the anterior segments of a leaf.
- Antiseptic.** Efficacious against putrefaction. Ex. Artemisia, (*Wormwood*.)
- Apetalous.** Without petals. Ex. Saururus.
- Apex.** The extremity, or summit, generally terminating in a point.
- Aphyllous.** Without leaves. Ex. Saltwort.
- Appressed.** Pressed close upon something else. When hairs lie close to the surface of a leaf, they are said to be appressed.
- Apterus.** Without wings, or membranous margins. Ex. The radical flowers of Polygala rubella.
- Arachnoid.** Resembling a spider's web.
- Aquatic.** Growing in the water. Ex. Pond Lily.
- Arborescent.** Tree-like. Approaching in size to that of a tree. Ex. Cornus florida, (*Dogwood*.)
- Arillus.** An appendage adhering to the hilum of certain seeds.
- Aristate.** Bearded. Ex. Barley.
- Armed.** Furnished with thorns and prickles. Ex. Thorn-bush, Green-briar.
- Aroma.** The aromatic or spicy quality of plants. Ex. Mint, Sassafras.
- Articulated.** Jointed. The place where one part is joined to another. Many of the grasses have articulated culms.
- Arundinaceous.** From *arundo*, a reed. Resembling reeds, or large grasses.
- Ascending.** Rising, somewhat obliquely from the ground.
- Attenuated.** Diminishing. Growing thin, or slender.
- Auriculate.** Furnished with appendages, or projections resembling ears. Ex. Jasminum auriculatum.
- Awn.** The rough beard, or bristle, in the flowers of the grasses.
- Awed.** Having awns.
- Axis.** Centre of vegetation, as the pith of vascular plants. The Cryptogamia and Endogenous plants have many of them no axes.
- Banner.** The upper and largest petal in papilionaceous flowers. Ex. Pea, Bean.
- Barren.** Producing no fruit. Containing stamens, without pistils.
- Bell-shaped.** Campanulate. A short tube, rounded at the base, and wide at the brim. Ex. Bell-flower.
- Berry.** A succulent fruit with the seeds imbedded in the substance. Ex. *Phytolacca decandra*, (*Poke*.) Orange.
- Bicuspidate.** Ending in two points.

- Biennial.* Living two years, during the second of which the flower and seeds are produced. Ex. Beet, Turnip.
- Bifid.* Two-cleft; nearly divided into two parts.
- Biocular.* Having two cells, Fig. 132.
- Bipinnate.* Doubly winged. When both the leaf and its subdivisions are winged. Ex. Honey Locust, Fig. 69.
- Bitermate.* Twice ternate. The petiole bearing three ternate leaves. Ex. *Fumaria lutea*, (*Fumitory*.) Fig. 62.
- Bivalve.* Two-valved. Ex. Pea-pod.
- Border.* The edge or spreading part of the corolla.
- Brachiate.* Branches opposite, like the arms, each pair crossing those below, or alternately crossing each other, Fig. 15.
- Bracte.* Floral leaf. This is placed near the flower, and differs from the other leaves. Ex. *Bartsia coccinea*, (*Painted cup*.)
- Bristles.* Rigid hairs. Not prickly.
- Bulbous.* Having bulbs, or globular protuberances, as the Tulip root, Fig. 9.
- Bulbs.* Under ground buds, or roots consisting of scales lying one over the other. Ex. Onion. Some of the Lily tribe bear bulbs in the axils of their leaves. Ex. *Lilium bulbosum*.
- Caducous.* Falling off early; sooner than deciduous. Ex. Calyx of the Poppy.
- Cæspitose.* Grass-like, forming little tufts. Ex. Pink, Thrift.
- Calcarate.* Spurred, or spur-shaped. Ex. Larkspur.
- Calyxiform.* Shaped like a calyx.
- Calyculated.* Furnished with an additional outer calyx. Ex. Hibiscus.
- Calyptra.* Literally an extinguisher. The cap which tips the theca of a Moss.
- Calyptrate.* Having a covering resembling an extinguisher.
- Calyx.* The outer and lower portion of a flower, commonly of a green color. Ex. Pink, Fig. 93.
- Campanulate.* Shaped like a bell, Fig. 109.
- Canescent.* Whitish. Hoary.
- Canaliculate.* Having channels, or furrows.
- Capillary.* Very slender, resembling hair.
- Capitate.* Growing in small heads. Ex. Trefoil, (*Clover*.) Fig. 135.
- Capituli.* Little heads. Ex. Reseda, (*Mignonette*.)
- Carina.* A keel like that of a boat; also the two lower petals of papilionaceous flowers. Ex. Pea, Bean, Fig. 115.
- Carinate.* Keel-shaped. Ex. *Urticularia minor*, (*Bladder-wort*.)
- Carious.* Decayed.
- Carminative.* Stomachic Substances, which relieve pain. Ex. Peppermint, Caraway.
- Carnose.* Fleshy in substance.
- Carpella.* The small parts of which compound fruits are formed. Ex. *Actinocarpus*.
- Carpology.* The science which treats of the structures of fruits and seeds.
- Caplin.* See Ament.
- Caudate.* Tailed, having a tail-like appendage.
- Caudex.* The upper part of the root whence the stalk springs.
- Caulescent.* Having a true stem which bears leaves. Ex. Hibiscus.
- Cauline.* Growing on a stem.
- Cell.* A cavity or compartment, generally applied to a capsule, or seed vessel, Fig. 132.

- Cellulares.** The second division of Lindley's system. Plants having cells, but not spiral vessels. Ex. Mushrooms.
- Cellular.** Made up of little cells. Ex. Stem of the Eriocaulon.
- Cephalic.** Good for the head.
- Cernuous.** Nodding, or drooping. Ex. *Geum rivale*, (*Water avens*.)
- Chalazu.** A spot on the seed, indicating the spot where the vessels of the raphe terminated.
- Chaffy.** Made of membranes like chaff. Ex. *Gnaphalium*, (*Life Everlasting*.)
- Cilicle.** Fringed with hairs, like the eye-lashes. Ex. *Lopezia cordata*.
- Cinereous.** Ash-colored; grey. Ex. *Grevillea cinerea*.
- Cirrrose.** Tendrilled, having claspers. Ex. Gourd, *Gloriosa*.
- Clasping.** Partly surrounding the stalks, as the leaves of Garden Lettuce, Fig. 81.
- Clavate.** Club-shaped. Largest at the top. Ex. Pedicels of *Actea rubra*.
- Claw.** The narrow part of the petal, where it is attached. Ex. Pink, Fig. 114.
- Cleft.** Divided less than half way. Mostly applied to the calyx.
- Coadunate.** Uniting, or adhering at the base.
- Colored.** Some color different from green, the usual color of plants.
- Compound.** Used in botany to express the union of several things in one: thus a compound flower consists of many small florets, or simple flowers; a compound umbel is made up of several smaller umbels, &c.
- Compressed.** Pressed together; flattened.
- Cone.** The fruit of the Pine tribe, Fig. 142.
- Conglomerate.** Crowded together in a spherical form.
- Connate.** Joined together at the base. Ex. *Triostium perfoliatum*, Fig. 83.
- Connivent.** Converging, or approaching each other. Ex. *Datura ferox*.
- Contorted.** Twisted. Bent from the ordinary position.
- Corculum.** The germ, or embryo of the future plant, contained in the seed commonly between the cotyledons. Ex. Garden Bean.
- Cordate.** Heart-shaped. Ex. Leaves of the Aster, *macrophyllus*, Fig. 35.
- Coriaceous.** Resembling leather. Thick and tough. Ex. Leaves of the *Chionanthes Virginica*, (*Virginian Fringe-tree*.)
- Corneous.** Horny. Having the consistence of horn.
- Corniculate.** Horn-shaped.
- Corolla.** The delicate colored part of the flower, on which its beauty generally depends. It is the second covering of the bud, within the calyx. See p. 53, Fig. 94.
- Cortical.** Belonging to the bark.
- Corymb.** A raceme, or panicle, in which the stalks of the lower flowers, being longest, the whole is nearly flat on the top. Ex. *Achillea*, (*Yarrow*.) Fig. 130.
- Corymböse.** Formed after the manner of a Corymb.
- Costæ.** Literally ribs; applied by botanists, sometimes to the midrib of the leaf, and sometimes to any projecting round elevations, having the same direction as the axis of the fruit.
- Costate.** Ribbed.
- Cotyledons.** Seed leaves, or seed lobes. The fleshy parts of seeds, well known in the Bean, as the two halves which are separated in the act of sprouting, and rise above the ground, Fig. 143.

- Crenate*. Notched, or scalloped, the divisions being rounded. Ex. *Glechoma herderacea*, (*Gill.*)
- Crenulate*. Full of notches.
- Crest.* • Applied to some elevated appendage terminating a particular organ: a stamen is crested when the filament projects beyond the anther.
- Cruciform*. Having four petals placed like a cross. A flower is cruciform, or cruciate, when four equal petals are placed opposite to each other at right angles. Ex. Cabbage, Fig. 116.
- Crystalline*. Resembling crystals. Ex. *Mesembryanthemum lanceolata*.
- Cryptogamous*. Belonging to the Cryptogamia, the last of the Linnæan Classes, and in which neither stamens nor pistils are visible. Ex. Fern, (*Polypod.*) Fig. 24.
- Cucullate*. Hooded, or cowl'd. Ex. Spathe of the *Arum tryphyllum* (*Indian Turnip*,) Fig. 129.
- Cucurbitaceous*. Gourd, or Melon like.
- Culm.* The stem of Grasses, and similar plants. Ex. Wheat, Fig. 20.
- Culmiferous*. Producing culms.
- Cultrate*. Shaped like a pruning knife.
- Cuneate*. Wedge-shaped.
- Cuspidate*. Having a sharp, straight point, Fig. 50.
- Culicle*. The outer skin, or epidermis.
- Cut-toothed*. Cut and toothed at the same time.
- Cyathiform*. Cup-shaped. Formed like a wine glass. Ex. *Narcissus pulchellus*.
- Cylindrical*. Cylinder-shaped; round, but not tapering. Ex. *Salicornia radicans*.
- Cyme*. A mode of inflorescence in which the flower stalks rise from the same point, but are afterwards variously sub-divided. Ex. *Scirpus lacustris*.
- Decagynous*. Having ten styles. Ex. *Phytolacca decandria*, (*Poke.*)
- Decandrous*. Having ten stamens. Ex. Plants of the 10th Class, as *Kalmia*, *Pyrola*.
- Deciduous*. Falling off. It means later than caducous. All plants which shed their leaves at autumn, are called deciduous, and are thus distinguished from *evergreens*.
- Declinate*. Tending downwards. Ex. Stamens of the *Rhododendron maximum*.
- Decompond.* Twice compound. A leaf is decompond when it is twice pinnated. Ex. *Cassia*, *Mimosa*.
- Decorticated*. Disbarked. When the bark is wanting.
- Decumbent*. Lying down, or leaning on the ground. Ex. *Lespedeza prostrata*.
- Decurrent*. When the edge of the leaf runs down the stem. Ex. Many of the *Thistles*.
- Decursive*. Having a tendency to run down.
- Decussating*. Crossing each other in pairs. Ex. *Bidens crysanthemoides*.
- Deflected*. Bent to one side.
- Dehiscent*. Gaping, or opening. Applied to the opening of capsules, or the mode in which they discharge their seeds. Ex. *Columbine*. The capsule of the Poppy is *indehiscent*, discharging its seeds by orifices.
- Deltoid*, or *Delta-leaved*. Shaped like the Greek Delta Δ . Ex. *Prenanthes*.

Dentate. Toothed, having the margin divided into incisions resembling teeth. Ex. *Veronica acuta*, Fig. 46.

Dentato-sinuate. Toothed and scalloped. Ex. *Gerardia flava*.

Denticulate. Minutely toothed.

Dentures. Teeth. The sharp points which separate the notches of leaves.

Depressed. Pressed in at top, or flattened. Ex. Capsule of the Poppy.

Diadelphous. Having the stamens united in two parcels. Ex. Pea, Bean, see p. 164.

Diandrous. Having two stamens. Ex. *Collinsonia*.

Dichotomous. Forked. A stem that ramifies in pairs, Fig. 15.

Dicoccus. Having two cocci, grains, or seeds.

Dicotyledonous. Having two cotyledons. Ex. Bean.

Didynamous. Belonging to the class Didynamia; characterized by two long and two short stamens, and a ringent corolla. Ex. Hyssop, Mint.

Digitate. Finger-shaped. When the leaf is composed of five parts all distinct and uniting on the same petiole. Ex. *Panax quinquefolium*.

Digynous. Having two styles. Ex. *Gerardia*.

Diacious. Having barren flowers on one plant and fertile ones on another. Ex. Willow.

Discoid. Applied to compound flowers, when there is no ray, the centre being filled with florets. Resembling a disk.

Dissepiment. The partitions by which a capsule is divided, Fig. 132.

Distichous. Growing in two opposite rows, or ranks. Ex. Leaves of the Lily and Iris.

Divaricate. Growing in a straggling manner. Ex. *Veronica pinnata*. Also, diverging so as to turn backwards.

Dodecandrous. Having 12 stamens. Ex. Agrimony.

Divergent. Spreading widely from a centre.

Dolabriform. Axe, or hatchet shaped.

Dorsal. Growing on the back.

Drupe. A succulent fruit, or rind containing a bony nut or stone in the centre. Ex. Cherry, Fig. 137.

Drupaceous. Resembling or bearing drupes.

Echinate. Beset with prickles. Hedge-hog like. Ex. *Amomum subulatum*.

Elliptic. Oval; as the leaves of *Magnolia glauca*.

Elongated. Exceeding a common or average length.

Emarginate. Having a notch in the end. Ex. *Canna coccinea*.

Embryo. The same as corculum.

Enneandrous. With nine stamens.

Ensiform. Sword shaped; twoedged; as the leaves of *Iris versicolor*.

Entire. Even and whole at the edge; as the leaves of *Rhus vernix*.

Equitant. Edges of the leaves alternately lapping over each other. Ex. Iris.

Ephemeral. Lasting but a day.

Epidermis. See Cuticle.

Epigynous. Above the germen.

Eroded. Appearing as if gnawed at the edge.

Esculent. Eatable.

Evergreen. Remaining fresh through the winter. Not deciduous. Ex. *Kalmia*.

Exserted. Projecting or extending out of the flower or sheath.

Endogenous. Increasing on the inside. Ex. Cane.

Exogenous. Increasing on the outside. Ex. Oak.

Falcate. Sickle-shaped. Linear and crooked.

Farina. The pollen. Also meal or flour.

Farinaceous. Mealy.

Fascicle. A bundle. Ex. Sweet William.

Fascicled, or fasciculate. Collected in bundles.

Fastigiate. Flat topped. Ex. Aster umbellata.

Favose. Resembling a honey comb.

Ferns. An order of cryptogamous plants bearing the fructification commonly on the back of the leaf, or in spikes, made up of minute capsules opening transversely. Ex. Polypody, (*Polypod*.)

Fertile. Containing perfect pistils and yielding fruit.

Filiform. Thread like, or very slender.

Fimbriate. Finely divided at the edge like fringe. Ex. Orchis fimbriata.

Fistulous. Hollow or tubular. Ex. Eupatorium verticillatum.

Flagelliform. Spreading like a fan.

Flagelliform. Like a whip lash.

Flexuous. Serpentine or zigzag.

Floral leaf. See Bracte.

Floral envelopes. The calyx, bractæ, and corolla, which envelope the inner parts of the flower.

Foot-stalk. The stalk of either flower, or leaf. Ex. Aster.

Floret. A little flower. One in an aggregate or compound flower.

Floscular. A floret in a compound flower which is tubular, not ligulate.

Follicle. A seed vessel which opens lengthwise, or on one side only; as in *Apocynum androsamifolium*, Fig. 136.

Froned. The leaf of cryptogamous plants. Ex. Fern.

Fructification. The flower and fruit with their parts.

Frutescent. Becoming shrubby.

Fruticose. Shrubby.

Fugacious. Lasting only for a short time.

Fungi. The order of cryptogamous plants to which the mushrooms belong.

Fungous. Growing rapidly and preternaturally, with a soft texture like the fungi. Ex. Mushrooms, (*Toad stools*.)

Funnel shaped. Tubular at bottom and gradually expanding at top; as the flowers of *Datura stramonium*.

Fulvous. Yellow; fox colored.

Furfuraceous. Resembling bran.

Fusiform. Spindle shaped. When a root is large at top and tapers downwards, as in the Carrot and Radish.

Galls. Excrescences caused by the bite of an insect. Ex. Oak.

Gemmaceous. Belonging to a bud. Made of the scales of a bud.

Generic. Belonging to a genus.

Geniculate. Bent like a knee.

Genus. A family of plants agreeing in their flower and fruit.

Germ. The lower part of the pistil, which afterwards becomes the fruit.

Germination. The sprouting of a seed.

Gibbous. Swelled out, commonly on one side.

Glabrous. Smooth, as it regards hairiness or pubescence. Ex. *Kalmia*.

Gland. A small roundish appendage, apparently performing some function of secretion or excretion. Ex. Moss Rose.

Glandular pubescence. Hairs tipped with little heads or glands.

Glaucous. Sea green. Pale bluish green.

Glume. The scales, valves, or chaff, which make the calyx and corolla of grasses. Ex. the Oat.

Glutinous. Adhesive, viscid, covered with an adhesive fluid. Ex. *Salvia glutinosa*.

Gramina. Grasses, and grass-like plants. Ex. Wheat.

Gramineous. Resembling grasses.

Granular. Formed of grains, or covered with grains.

Gymnospermous. Having naked seeds, Ex. Mint.

Gynandrous. Having the stamens growing on the pistils. Ex. Ladies' slipper.

Gyrose. Turning round like a crook.

Habit. The general external appearance of a plant, by which it is known at sight.

Halberd shaped. See *Hastate*.

Hastate. Shaped like a halberd. It differs from *arrow shaped* in having the barbs or lateral portions more distinct and divergent. Ex. *Prenanthes alba*.

Head. A dense, round collection of flowers, which are nearly sessile. Ex. Clover.

Helmet. The concave upper lip of a labiate flower.

Heptandrous. Having seven stamens. Ex. *Trientalis*.

Herb. All that portion of a plant which is not included in the root, or fructification; as the stem, leaves, &c.

Herbaceous. Not woody. Ex. Indian Corn, Cabbage.

Hexandrous. With six stamens. Ex. Lily, Tulip.

Hilum. The scar or mark on a seed, where it was attached to the plant, or seed vessel.

Hirsute. Rough with hairs. Ex. *Agrimonia eupatoria*.

Hispid. Bristly. More than *hirsute*. Ex. *Justicia ciliaris*.

Hooded. See *Cucullate*.

Horn. See *Spur*.

Hyaline. Crystalline; transparent.

Hybrid. A mongrel or intermediate species between two others, from which it is descended.

Hypocrateriform. Salver shaped. With a tube abruptly expanded into a flat border.

Hypogynous. Situated below the germen.

Icosandrous. Having about twenty stamens growing on the calyx and not on the receptacle. Belonging to the class *Icosandria*.

Imbricate. Lying over each other like scales, or the shingles of a roof.

Included. Wholly received or contained in a cavity. The opposite of *exserted*.

Incrassated. Thickened upward. Larger toward the end.

Incumbent. Lying against or across.

Indigenous. Native. Growing originally in a country.

Indusium. Plural *Indusia*. The involucre or veil which covers the fruit of Ferns.

Indehiscent. Not gaping, or opening by valves.

Inferior. Lowermost. Used to express the relative situation of the calyx and germ. An inferior flower is one in which the calyx and corolla are below the ovary. Ex. *Rhexia Virginica*.

Inflated. Tumid and hollow. Blown up like a bladder.

Inflorescence. The manner in which the flowers are situated or connected with the plant, and with each other.

Infundibuliform. Funnel shaped, which see.

Inscised into. Growing out of.

Internode. The space between joints.

Interruptedly pinnate. When smaller leaflets are interposed among the principal ones. Ex. *Agrinonia Eupatoriæ*.

Involucre, or Involucrum. A sort of general calyx serving for many flowers; generally situated at the base of an umbel, or head; as in *Conium maculatum*.

Involucel. A partial involucre.

Irregular corolla. Having its upper and lower sides unlike. Ex. Violet.

Joints. The places where two pieces of stem are articulated.

Keel. The under petal of a papilionaceous flower. Also the lower side of the midrib of a leaf.

Keelcd. Shaped like a keel.

Kerncl. The nucleus or seed of a nut.

Kidney shaped. Heart-shaped without the point, and broader than long.

Labellum. The front section of an orchideous flower.

Labiata. Having an upper and lower lip, as in flowers of the class Didynamia, Fig. 112.

Laciniate. Cut, torn, and jagged, page 31.

Lactescent. Yielding a white, or milky juice, when wounded.

Lamellated. In thin plates.

Lamina. The border or flat end of a petal, in distinction from its claw. Also a thin layer, plate or membrane of any kind.

Lanceolate. Spear shaped. Narrow, with both ends acute, as in the leaves of *Erythronium Americanum*.

Lanuginous. Woolly.

Lateral. At the side.

Leaf-bud. That part of the plant by which the individual is propagated.

Leafet. A partial leaf. A constituent of a compound leaf.

Legume. A pod or seed vessel having its seeds attached to one side or suture; commonly of a long form and not jointed, Fig. 135.

Leguminous. Bearing legumes.

Liber. The inner bark.

Ligneous. Woody.

Ligulate. Ribbon shaped. A kind of corolla found in compound flowers, consisting of a tube at bottom, continued into a long flat portion at top; as in the florets of the Dandelion.

Liliaceous. Resembling the Lily.

Limb. The border or spreading part of a monopetalous corolla.

Linear. Long and very narrow, with parallel sides: as the leaves or grasses.

Lip. The upper or under side of the mouth of a labiate corolla or nectary. In Orchideous plants, the lower lip of the nectary is usually the most conspicuous part of the flower.

Lobe. A large division or distinct portion of a leaf or petal.

Lobed. Divided into lobes; as the leaves of *Laurus sassafras*, Fig. 45.

Loculicidal dehiscence. When the valves open vertically, the compartments remaining, as in Lilac, Lily.

Loment. A pod resembling a legume, but divided by transverse partitions.

Lunate. Shaped like a half moon, Fig. 36.

Lyrate. Pinnatifid, with a large roundish leaflet at the end, Fig. 38.

Marcescent. Withering.

Maritime. Growing near the salt water.

Medulla. The pith.

Membranous. Very thin and delicate.

Midrib. The large central vein of a leaf which is a continuation of the petiole.

Monadelphous. Having the stamens united into a tube at base. Ex. Mallows.

Monandrous. Having one stamen. Ex. Saltwort.

Moniliform. Arranged like the beads of a necklace.

Monœcious. Having barren and fertile flowers on the same plant. Ex. Alder.

Monogynous. With one style. Ex. Lily.

Monopetalous. Having but one petal, i. e. the corolla of one piece. Ex. Datura.

Monophyllous. Consisting of one leaf, or piece.

Mosses. The second order of the class Cryptogamia. Small plants, with lids on the capsules, Fig. 211.

Mucronate. Having a small point projecting from an obtuse end.

Multipartite. Many parted. Ex. Leaf of Yarrow.

Muricate. Covered with sharp spines or prickles. Ex. *Panicum muricatum*.

Musci. See Mosses.

Nectariferous. Bearing honey.

Nectary. The part of the flower which produces honey. The term is also applied in certain instances to any internal, supernumerary part of the calyx or corolla, Fig. 117.

Nerves. Parallel veins.

Nerved. Marked with nerves. Ex. Narrow Plantain.

Nodding. Inclining to one side. Partly drooping.

Nucleus. The kernel or seed of a nut.

Nut. A seed inclosed in a hard shell. Hazle-nut.

Ob. A particle, which, when prefixed to any other term, denotes the inversion of the usual position; as obovate, obcordate, &c., i. e. inversely ovate, inversely cordate, &c.

Obconic. Conic with the apex downward.

Obcordate. Heart-shaped, with the point inward, or downward.

Oblong. Longer than oval, with the sides nearly parallel, Fig. 30.

Obovate. Ovate, but inverted.

Obsolete. Indistinct, appearing as if worn out.

Obtuse. Blunt, rounded, not acute, Fig. 52.

Ochroleucous. Whitish yellow.

Octandrous. With eight stamens. Ex. *Epilobium*.

Officinal. Kept for sale as medicinal.

Opaque. Not transparent.

Operculum. The lid which covers the capsules of mosses.

Opposite. Standing directly against each other on opposite sides of the stem; as the leaves of *Spigelia Marilandica*, Fig. 77.

Orbicular. Circular, Fig. 26.

Orchideous plants. A natural order of plants in the class Gynandria,

having irregular flowers, a remarkable lip, and glutinous pollen. Related to the genus *Orchis*.

Oval. Elliptical; as the leaves of *Magnolia glauca*, Fig. 29.

Ovate. Egg-shaped. Oval with the lower end largest; as the leaves of *Sabbatia angularis*, Fig. 27.

Ovarium. The part formerly called germen.

Orules. The young seeds of the plant, contained in the ovarium.

Palate. A large obtuse projection which covers the throat of a personate flower, Fig. 112.

Palaceous. Chaffy. Ex. Receptacle of *Bidens*.

Palmate. Hand shaped. Deeply divided into spreading and somewhat equal segments; as the leaves of *Podophyllum peltatum*, Fig. 44.

Panduriform. Contracted in the middle, like a violin, Fig. 39.

Panicle. A loose, irregular bunch of flowers, with sub-divided branches. Ex. Grasses, Fig. 128.

Papilionaceous. Having an irregular corolla, like the Pea blossom; consisting of four petals, of which the uppermost is called the *banner*; the two lateral ones *wings*; and the lower one, which is commonly boat shaped, the *keel*. Mostly belonging to the class *Diadelphia*, Fig. 115.

Pappus. The down of seeds. A feathery appendage, Fig. 144.

Parasitic. Growing on another plant and drawing nourishment from it.

Parenchyma. The cellular substance of vegetables. Ex. Mushrooms.

Partial. This term is applied to small or constituent parts, in distinction from general.

Partition. The dividing wall in seed vessels, Fig. 133.

Parted. Deeply divided, more than cleft. Ex. Corolla of *Trientalis*.

Pectinate. Like the teeth of a comb. Intermediate between *fimbriate* and *pinnatifid*.

Pedate. Having a central segment or leaf which is simple and two lateral ones which are compound, Fig. 64.

Pedicel. The ultimate branch of a peduncle. A little stalk.

Peduncle. A stem bearing flowers or fruit, which is the branch of another stem.

Pellicle. A very thin stratum or coat.

Peltate. Having the stalk attached to some part of the surface or disc, and not the margin, Fig. 79.

Pendulous. Hanging down.

Pencilled. Eating like a painter's pencil or brush.

Pentandrous. Having five stamens. Ex. Class *Pentandria*, Violet.

Perennial. Lasting more than two years. Ex. Oak, Rose-bush.

Perfect flower. One which possesses stamens and pistils, and produces fruit.

Perfoliate. Surrounding the stem on all sides, and perforated by it. It differs from *counate*, in not consisting of two leaves. Ex. *Eupatorium perfoliatum*.

Pertanth. A sort of calyx which is immediately contiguous to the other parts of fructification, Fig. 100.

Pericarp. A seed vessel, or whatever contains the seed. Ex. Pea pod, p. 71.

Permanent. See *Persistent*.

Persistent. Not falling off. Those parts of a flower are persistent which remain till the fruit is ripe.

Perigynous. Inserted into the calyx.

- Personate.** Masked. Having the mouth of the corolla closed by a prominent palate, Fig. 112.
- Petal.** The leaf of a corolla, usually colored, Fig. 114.
- Petaloid.** Resembling petals.
- Petiole.** The stalk which supports a leaf, Fig. 22.
- Phænogamous.** Not Cryptogamous. Applied to all plants which have visible stamens and pistils. Ex. Lily, Apple.
- Pilose.** Hairy. With a stiff pubescence.
- Pinna.** The leaflets or divisions of a pinnate leaf. Ex. Cassia.
- Pinnate.** A leaf is pinnate when the leaflets are arranged in two rows on the sides of a common petiole; as in *Rhus vernix*, Fig. 65.
- Pinnatifid.** Cut in a pinnate manner. It differs from pinnate in consisting of a single or continuous leaf, not compound, Fig. 43.
- Pistil.** A constituent part of a flower, including the germ, style, and stigma. In a regular flower, it forms the central part.
- Pistillate.** Having pistils, but no stamens.
- Plaited.** Folded like a ruffle or fan; as the leaves of *Veratrum viride*, Fig. 58.
- Plumose.** Feathery. Feather-like, Fig. 146.
- Plumula.** Part of the Corculum of a seed, which afterwards forms a new plant with the exception of a root, Fig. 143.
- Pod.** A dry seed vessel, not pulpy; most commonly applied to legumes and siliques.
- Poindal.** See *Pistil*.
- Polyadelphous.** Belonging to the class Polyadelphia, in which the stamens are united into several parcels. Ex. Hypericum, (*St. John's wort*.)
- Polyandrous.** Having many disconnected stamens inserted into the receptacle. Ex. Water Lily.
- Polycotyledonous.** Having seeds with more than two cotyledons.
- Polygamous.** Having some flowers which are perfect, and others which have stamens only, or pistils only.
- Polygynous.** Having many styles.
- Polymorphous.** Changeable. Assuming a variety of forms.
- Polypetalous.** Having many petals. Ex. The Rose.
- Polyphyllous.** Having many leaves.
- Pome.** A pulpy fruit having a capsule within it; as the apple, Fig. 141.
- Premorse.** Bitten off. The same as *abrupt*.
- Prickle.** The prickle differs from the thorn in being fixed to the bark only, and not to the wood, Fig. 90.
- Prismatic.** Having several parallel, flat sides.
- Procumbent.** Lying on the ground.
- Proliferous.** An umbel or flower is said to be proliferous when it has smaller ones growing out of it.
- Pseudopinnate.** Falsely or imperfectly pinnate.
- Pubescent.** Hairy or downy. Ex. Mullein.
- Pulp.** The soft, juicy, cellular substance found in berries and similar fruits.
- Pulpy.** Filled with pulp. Ex. Orange.
- Pulverulent.** Dusty. Composed of powder, or appearing as if covered with it.
- Punctate.** Appearing as if pricked full of small holes, or dots. Ex. Hypericum.
- Punctiform.** Resembling dots.
- Pungent.** Sharp, acrid, pricking.
- Putamen.** The inner part of a hard pericarp. Ex. Peach stone.
- Pyriform.** Shaped like a pear.

Quadrifid. Divided four times.

Quaternate. Four together.

Quinate. Five together.

Quinquefid. Divided into five parts.

Raceme. A cluster; a kind of inflorescence, in which the flowers are arranged by simple pedicels on the sides of a common peduncle, Fig. 126.

Rachis. The common stalk to which the florets and spikelets of grasses are attached. Also the midrib of some leaves and fronds.

Radiate. Having ligulate florets placed like rays at the circumference, as in certain compound flowers; or having the outer petals largest, as in certain cymes and umbels. Ex. Aster.

Radical. Growing immediately from the root. Ex. Dandelion, Fig. 75.

Radicule. The part of the coraculum which afterwards forms the root.— Also the minute branch of the root, Fig. 143.

Ray. The diverging florets or petals which form the outside of radiate flowers, cymes and umbels. Ex. Helianthus.

Receptacle. The end of a flower stalk, being the base to which most or all the parts of fructification are attached, Fig. 153.

Reclined or Reclining. Bending over, with one end inclining toward the ground.

Recurved. Curved backwards.

Reflexed. Bent backward, more than recurved.

Reniform. Kidney-shaped. Heart-shaped, without the point, Fig. 34.

Repand. Slightly wavy or serpentine at the edge; as the leaves of *Menyanthes trifoliata*.

Resupinate. Turned upside down; as the leaves of *Juniperus communis*

Reticulate. Net-like. Having veins distributed like net-work, Fig. 56.

Retuse. Having a slight sinus, or superficial notch in the end. Less than emarginate.

Revolute. Rolled backward or outward.

Rhomboidal. Having four sides, with unequal angles.

Ribbed. Marked with parallel ridges or veins, Fig. 55.

Ringent. Irregular, with an upper and under lip. See *labiate*.

Rooting. Sending out lateral roots.

Rostellum. See *radicle*.

Rostrate. Furnished with a beak. Ex. Fruit of the Geraniums.

Rotate. Wheel-shaped. Flat without a tube; as in the flowers of *Solanum dulcamara*, Fig. 111.

Rugose. Wrinkled, Fig. 57.

Runcinate. Having large teeth pointing backward; as the leaves of the dandelion, Fig. 40.

Saccate. Having a bag or pouch.

Sagittate. Arrow-shaped. Like the head of an arrow, Fig. 37.

Salver-shaped. See *Hypocrateriform*.

Samara. A seed vessel not opening by valves, having a winged or membranous appendage.

Sarmentose. Running on the ground and striking roots from the joints, as the *strawberry*.

Sarcocarp. The hard, or bony part of a nut or shell.

Scape. A stalk which springs from the root, and supports flowers and fruit, but no leaves.

Scabrous. Rough.

- Scarious.** Having a thin, membranous margin.
- Scions.** Lateral shoots or off-sets from the root.
- Scrobiculate.** Covered with deep, round pits.*
- Seed vessel.** A vessel enclosing the seed.
- Seed.** That part of the plant which propagates the species.
- Segment.** A part or principal division of a leaf, calyx or corolla.
- Semibicircular.** Half divided into two valves.
- Seminal leaves.** The first leaves of a plant, or those formed from the cotyledons.
- Sepals.** The segments of the calyx.
- Sericeous.** Silky.
- Serrate.** Notched like the teeth of a saw, the points tending upward; as in the Strawberry and Rose leaves, Fig. 47.
- Serrulate.** Minutely serrate.
- Sessile.** Placed immediately on the stem, without the intervention of a stalk; as the leaves of the *Spigellia Marilandica*, Fig. 72.
- Setaceous.** Bristle-like.
- Sheath.** A tubular or folded leafy portion, enclosing the stem.
- Silicle.** A seed vessel constructed like a silique, but not longer than it is broad, Fig. 133.
- Silique.** A long pod or seed vessel of two valves, having its seeds attached to the two edges alternately, Fig. 133.
- Siliquose.** Having siliques.
- Simple.** Not divided, branched, or compounded.
- Sinuate.** Having sinuses at the edge, Fig. 42.
- Sinus.** A large rounded indentation or cavity.
- Sori.** Plural of *Sorus*. The most common fruit of ferns, consisting of small clusters of minute capsules on the back of the leaf.
- Spadix.** An elongated receptacle of flowers, commonly proceeding from a spathe; as in *Arum triphyllum*, Fig. 129.
- Spathe.** A sheathing calyx opening lengthwise on one side, and consisting of one or more valves. See Spadix.
- Spatulate, or spatulate.** Obtuse or large at the end, and gradually tapering into a stalk at base; as in the leaves of *Statice Caroliniana*.
- Species.** A group or subdivision of plants agreeing with each other not only in their fructification, but in all other essential and permanent parts; and always reproducing the same kind.
- Specific.** Belonging to a species only.
- Spike.** A kind of inflorescence in which the flowers are sessile or nearly so on the sides of a long peduncle, Fig. 127.
- Spikelet.** A small spike.
- Spindle-shaped.** See Fusiform, Fig. 1.
- Spine.** A thorn, or sharp process growing from the wood, Fig. 89.
- Spur.** A sharp hollow projection from a flower, commonly the nectary, Fig. 117.
- Squamiform.** Scale-shaped.
- Squarrose, or Squarrous.** Ragged. Having reflected or divergent scales.
- Stamen.** The part of the flower on which the Linnæan classes are founded. It commonly consists of the *filament*, or stalk, and the *anther* which contains the pollen, Fig. 96.
- Staminate.** Having stamens, but no pistils.
- Standard.** See Banner, Fig. 115.
- Stellate.** Like a star, Fig. 78.
- Stem.** A general supporter of leaves, flowers and fruit.
- Stemless.** Having no stem, properly so called, but only a scape, Fig. 21.

Sterile. Barren.

Stigma. The summit or extremity of the pistil, Fig. 97.

Stipe. The stem of a fern, or fungus; also the stem of the down of seeds; also a particular stalk of germs, seeds, &c., which is superadded to the pedicel, Fig. 25.

Stipitate. Supported by a stipe.

Stipule. A leafy appendage situated at the base of petioles or leaves, Fig. 86.

Stipular. Belonging to stipules.

Stoloniferous. Having scions or running shoots. Ex. Indian corn.

Striate. Marked with fine parallel lines.

Strigose. Bristly.

Strobile. A cone; an ament with woody or rigid scales, as in the fruit of pines, firs, &c., Fig. 142.

Style. The part of the pistil which is between the germ and stigma, Fig. 97.

Sub. A particle prefixed to various terms, to imply the existence of a quality in a diminutive or inferior degree, as

Subacute. Somewhat acute. Less than acute, &c.

Subsessile. Nearly sessile.

Subserrate. Slightly serrate, &c.

Subulate. Awl-shaped. Narrow, stiff and sharp pointed, Fig. 33.

Succulent. Juicy. Ex. Peach, Orange.

Sucker. A shoot from the root, or lower part of the stem.

Suffrutescent. Somewhat shrubby. Shrubby at base.

Sulcate. Furrowed.

Supradecomposed. More than decomposed. Many times subdivided.

Suture. The line or seam formed by the junction of two valves of a seed vessel, Fig. 133.

Tendril. A filiform appendage of certain vines, which supports them by twining round other objects.

Terete. Round, cylindrical.

Terminal. Extreme, situated at the end.

Ternate. Three together; as the leaves of *Menyanthes trifoliata*.

Tetradynamous. Having four long and two short stamens.

Tetrandrous. Having four stamens.

Thorn. See Spine.

Throat. The passage into the tube of a corolla.

Thyrse. A close, compact panicle.

Tomentose. Downy. Covered with fine matted pubescence.

Triandrous. With three stamens.

Trifid. Three cleft.

Trifoliate. Three leaved. See *Ternate*.

Trilobate. Three lobed.

Trilocular. Three celled.

Tripartite. Three parted.

Trivial name. The specific name.

Truncate. Having a blunt termination, as if cut off, as the leaves of *Liriodendron tulipifera*.

Tuber. A solid, fleshy knob.

Tuberous. Thick and fleshy, containing tubers; as the roots of the Potato, Peony, &c.

Tubular. Shaped like a tube. In a compound flower, the florets which are not ligulate, are called tubular.

Tunicated. Coated with concentric layers; as the Onion.

Turbinate. Shaped like a top or pear.

Umbel. A kind of inflorescence in which the flower stalks diverge from one centre, like rays; as in *Conium maculatum*.

Umbelliferous. Bearing umbels.

Umbilicate. Marked with a central depression.

Unarmed. Without prickles or thorns.

Uncinate. Hooked, hook-shaped.

Undulated. Wavy, serpentine, gently rising and falling.

Unguiculate. Inserted by a claw.

Unilateral. Growing all on one side, or with the flowers leaning to one side.

Urceolate. Pitcher-shaped. Swelling in the middle, and slightly contracted at top.

Valves. The segments or parts of a seed vessel, into which it finally separates. Also the leaves which make up the glume or spathe.

Vasculars. Plants with spiral vessels, woody stems, and reticulated leaves, one of the divisions of Lindley's system.

Variety. A subdivision of a species, distinguished only by characters which are not permanent; and which does not, with certainty reproduce its kind; as the varieties of *tulips*, *peaches*, &c.

Vaulted. Arched over, with a concave covering.

Veined. Having the divisions of the petiole irregularly branched on the under side of the leaf.

Ventricose. Swelling. Inflated.

Verrucose. Warty. Covered with little protuberances.

Vertical. Perpendicular.

Verticillate. Whorled. Having leaves given off in a circle round the stem.

Vesicular. Made of vesicles or little bladders.

Villous. Hairy, the hairs long and soft.

Virgate. Long and slender. Wand-like.

Virose. Poisonous, nauseous and strong to the smell.

Viscid. Thick, glutinous, covered with adhesive juice.

Vitellus. A part of certain seeds distinct from the albumen, but not rising out of the ground at germination.

Viviparous. Producing a collateral offspring by means of bulbs.

Wedge-shaped. Formed like a wedge, and commonly rounded at the largest end.

Wheel-shaped. See *Rotate*.

Wings. The two lateral petals of a papilionaceous flower.

Winged. Having the sides extended into a leafy expansion.

